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ABSTRACT

This study of rewards and recognition in the mathematical sciences in higher education utilized data gathered from site visits to 26 institutions, 3 open forums, and a survey of a sample of faculty and department chairs in mathematical sciences departments. Results found: (1) a substantial gap between what faculty think the reward structure should be and what it actually is; (2) an increased emphasis on research and scholarship; (3) a perception that research in the discipline is very important; (4) ambiguity and uncertainty about what should be included in the definition of scholarship; (5) lack of effective communication between various organizational levels; (6) vital role of the department chair for departmental well-being; (7) dissatisfaction with teaching evaluation methods; (8) discomfort with evaluation of faculty duties; (9) quality of life issues of major importance in rewards structures; and (10) interest in a combination of across-the-board and merit increases. The major recommendation is that departments ensure that their reward structure is broad enough to encompass the full array of activity required to fulfill the departmental and institutional missions. Six guiding principles for the recognition and rewards system are also suggested. An appendix discusses the definition of mathematical scholarship. A supplementary data report that accompanies this document reports on survey methodology, shows selected data, and contains a copy of the survey questionnaire. (Contains 21 references.) (JB)

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ED 382 071

Recognition and Rewards in the Mathematical Sciences

Report of the Joint Policy Board for Mathematics Committee on Professional Recognition and Rewards

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Dear Colleagues,

I am pleased to forward to you this report on Recognition and Rewards in the Mathematical Sciences. This report addresses a number of issues confronting the professorate in general and places them within the context of the mathematical sciences.

In institutions of higher education and in society, there is an implicit belief that scholarship, research and teaching are all valued. However, in practice, the measurement and rewarding of these activities is inconsistent and ill-defined. Not only do expectations for faculty embrace a wide spectrum, they also vary greatly among institutions. Often, expectations and interests about scholarship, research and teaching change over the course of an individual's academic career.

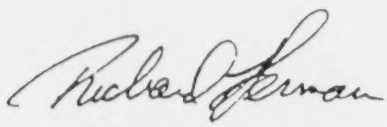
How should mathematics faculty determine, respond to, and deal with what is valued and rewarded in academic settings? This report is reflective of these issues and is intended to encourage both further debate and, hopefully, prolonged and pervasive activity in the areas of academic recognition and rewards.

The report argues the importance of all of us valuing a number of activities—and not undervaluing any one area. Further, by upgrading the value of teaching and outreach activities, for example, it posits that the mathematical sciences community can help lead the way in restoring balance in the academic enterprise which will benefit not only the entire mathematics community but also institutions and society at large.

As an outgrowth of this report, I hope to join with the mathematics community in the continuation of a thoughtful dialogue and I feel we can all take pride in our ability to focus on a set of critical issues which are fundamental to academic life.

My thanks to the committee and the many individuals who took time to share their views with us.

Sincerely,



Richard Herman
Chair, Joint Policy Board for Mathematics
Dean, College of Computer, Mathematical and Physical Sciences,
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Recognition and Rewards in the Mathematical Sciences

Report of the
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Committee on
Professional Recognition
and Rewards

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FROM THE CHAIR

Dr. Richard Herman
Chair, Joint Policy Board for Mathematics (JPBM)
1529 Eighteenth Street, NW
Washington, DC 20036

Dear Rich:

On behalf of the JPBM Committee on Professional Recognition and Rewards, I am pleased to transmit the Committee's report. Let me emphasize that the report is, above all, addressed to mathematical sciences department faculty and chairs in the nation's colleges and universities—in other words our colleagues—and I see it as an extended letter to them. We realize that we are speaking to an enormous range and diversity of departments and individuals, but there are some general observations and principles that, we believe, are widely valid, and it is on these that we focus in the report. We hope that the report will provide some assistance and guidance from the point of view of the discipline to our colleagues as they wrestle in their own institutions with the complex and possibly divisive issues that our report addresses.

The Committee took very seriously its charge to initiate a dialogue on the issues it studied. We started to do that very early in our work through forums at meetings of the three participating societies in JPBM and through more informal discussion in other contexts. We hope our survey questionnaires and site visits likewise provoked discussion of these issues in departments, and, above all, we hope the report we are now presenting will generate further discussion and debate. Our dissemination plan for the report is likewise intended to foster dialogue.

Our report, after a brief Foreword, begins with an Introduction which outlines the major issues. Then, based on the extensive study of the rewards system undertaken by the Committee, we put forward a series of Findings, each accompanied by discussion and data. Based on these Findings, the Committee puts forward one general recommendation which articulates the need for departments to ensure that their reward structure is broad enough to encompass the full array of activity required to fulfill the departmental and institutional missions. This recommendation is followed by a series of six Guiding Principles to help in its implementation. It has not escaped our attention that our recommendation and Principles have important implications for graduate education in the mathematical sciences and for how we prepare the next generation of practitioners of our profession.

We are acutely conscious of the fact that statements extracted from our report could be taken out of context and misused in ways that would run exactly counter to the intent of the

Committee. Our goal is to help promote changes that would strengthen the mathematical sciences enterprise in its many facets in the nation's colleges and universities, to be achieved through careful, thoughtful, and deliberate discussion of the issues, followed by appropriate changes in the recognition and reward system. We urge diligence in guarding against misuse of the report in ways that are contrary to this goal.

On behalf of the Committee, I would like to express our deepest thanks to several individuals whose splendid work was absolutely essential: first, William W. Adams of the University of Maryland who was chief of staff to the Committee, and John S. Bradley, Monica Foulkes, and Allyn Jackson of the American Mathematical Society. I want also to personally thank my fellow committee members for the many hours of work and many provocative and helpful discussions. Finally, I would like to thank the department chairs of the twenty-six departments that we visited as part of the information collection process. Their help in organizing the site visits was essential.

I believe that JPBM and the three participating societies, the American Mathematical Society, the Mathematical Association of America, and the Society for Industrial and Applied Mathematics, have taken a very important and forward-looking step in forming this Committee in 1991, and I would like to express our thanks to them. It was a pleasure to work with you and the other JPBM members during the last two and a half years.

Sincerely,

Calvin C. Moore
Chair, JPBM Committee on
Professional Recognition and Rewards

CONTENTS

Foreword	vii
Introduction	1
Findings	3
Recommendation & Guiding Principles	27
Appendix	39
Bibliography	41

FOREWORD

Numerous reports in recent years have called for many reforms in the nation's colleges and universities. These reports point to the recognition and rewards system as the key to stimulating the needed reforms. Two National Research Council reports, "Renewing U.S. Mathematics: Plan for the 1990s" (the second "David Committee" report) [5] and "Moving Beyond Myths" [7], state that the recognition and rewards system in mathematics must change if renewal and revitalization of the field are to take place. Such views are not confined to mathematics. A recent report of the National Science Foundation, "America's Academic Future" [19], calls on colleges and universities to "encourage and reward teaching excellence, instructional scholarship, and public service as well as research." Ernest Boyer, in his book "Scholarship Reconsidered" [9] makes many of the same points in a broader context.

However, there are differing views about the need for change and about how well the system works now. There was a clear need for a study of the present system that would provide the basis for guidelines for change. The Joint Policy Board for Mathematics (JPBM) felt that a report focusing on the mathematical sciences would not only be extremely valuable to the mathematical sciences community, but also constitute a useful contribution to the broader discussion within academia.

In October 1991, the JPBM formed the Committee on Professional Recognition and Rewards with the following charge:

- Initiate a dialogue on these issues within the mathematical sciences community.
- Identify contributions that should be recognized and rewarded.
- Determine how those involved (faculty members, department chairs, deans, mathematicians and managers employed in industry) value the various contributions and determine how the rewards system works in practice.
- Study methods of evaluation of types of contributions that are identified as being important.
- Articulate the ways contributions are, and can be, rewarded.
- Make recommendations on the contributions that should be recognized and rewarded and on methods to evaluate these contributions.
- Produce a plan to lead the community toward implementing the recommendations.

The Committee took a broad view in defining "recognition and rewards". That is, there is a wide variety of ways to recognize and reward faculty. These can be thought of in several categories. The first is salary and the second is promotion and tenure. The third comprises other types of individual tangible rewards such as sabbaticals, awards for outstanding

teaching, service or scholarship, grants and contracts, course release for special projects, etc. The fourth category we refer to as "quality of life"—issues that affect the feelings an individual has toward the institution but are not, in general, items directly received by the individual.

To provide a basis for its deliberations, the Committee undertook a study of the recognition and rewards system. This part of the Committee's work had three components: site visits to twenty-six institutions representing the full spectrum of types of institutions of higher education, open forums at meetings of the three JPEM societies, and a survey of a sample of faculty and chairs in mathematical sciences departments. The first part of the report presents the Findings of this study; particulars about the study are described at the beginning of the Findings section. The second part of the report presents the Committee's one general recommendation and six Guiding Principles for its implementation.

As with any committee report, not every member of the Committee will agree fully with every single statement or conclusion in the report. In fact diversity of opinion on the topics of this report is both natural and healthy. However, there is broad consensual agreement within the Committee on the report as a whole.

The Committee gratefully acknowledges financial support from the National Science Foundation under grants SED-9252716 and RED-9255720, and from the Exxon Education Foundation. Without this support, the work of the Committee could not have proceeded.

INTRODUCTION

The second half of the twentieth century has been a golden age for the mathematical sciences, a time of vitality for the entire field, of new connections among different branches of mathematics, of new links to other disciplines. The rise and ubiquity of computing has enormously enlarged the scope of mathematics, bringing the field to the cutting edge of technology. Computing, combined with the appropriate mathematics, has made possible a wide range of technological advances, such as the design of economical jet planes and the construction of codes for reliable and secure information transmission. Many talented young people have been attracted to graduate study and research in the mathematical sciences and the nation's graduate schools have produced a generation of scholars of exceptional talent.

Nevertheless, the mathematical sciences community today is under unprecedented new pressures. Some of these have to do with evolution within the field itself, but others are connected to changes in our society, of which mathematics is an organic part. The Committee took as a central part of its charge investigating how the recognition and rewards structure affects the ability of the mathematical sciences community to respond effectively to these changes.

Among the important internal changes are those related to the role of computers in the way many mathematicians in the traditional core areas do their research, the introduction of entirely new approaches to applications exemplified by computational mathematics, and the groundswell of interest in the mathematical sciences community in curriculum reform. This latter phenomenon is exemplified by the calculus reform movement which began seven or eight years ago and the other changes began to accelerate at about the same time.

Important external changes have to do with shifts in federal science funding, calls for educational reform, and waning public confidence in higher education. For fifty years after World War II, the federal government supported mathematical sciences research and graduate education in significant part because these enterprises were seen as essential to national security. With the end of the Cold War, federal funding of science has shifted toward enhancing economic competitiveness and there are increasing expectations that federally funded basic research should be more directly linked to national goals. Indeed the country is looking to its universities to play a greater role in solving economic and societal problems. Computation, applications of mathematics, and interdisciplinary work involving mathematics are increasingly important components of science, business, and industry. As science and engineering are asked to move in new directions, the mathematical sciences community must continue to play a leading role. Not doing so would be very detrimental to our profession.

At all educational levels, serious questions are being asked about the effectiveness of mathematics teaching and the relevance of what is taught. Integrating computers into the mathematics curriculum has been a continuing challenge. Another is insuring that mathematics education not only serves the needs of society, but also is available to all segments

of society, some of which have traditionally remained, and continue to remain, outside of the scientific, engineering, mathematical, and technological enterprise. Active engagement in the reform of mathematics education at the K–12 level is a critical task. These challenges represent both an obligation and an opportunity for the mathematical sciences community.

Declining public confidence in academia is another growing concern. Critics of higher education say that faculty members are not sufficiently committed to teaching and that colleges and universities do not strike the right balance between teaching and research. Many observers both inside and outside higher education are asking what fundamental principles should be used to determine this balance. This is not an easy question to answer.

Perhaps the greatest challenge facing the mathematical sciences community is to respond, as it must, to these societal changes, while at the same time continuing to advance the frontiers of knowledge in mathematics, attracting a diverse and talented group of young people to the field, and providing a stimulating and nurturing environment for them.

One difficulty is that the recognition and rewards structure in universities and colleges is often not broad enough to allow the community to respond to these changes. The issues discussed above were underscored in discussions that Committee members had with many mathematical scientists and university and college administrators. The Committee heard many serious concerns over issues such as the following:

- The rewards structure, especially at institutions that emphasize the research role of the professors, does not sufficiently take into account the changing contributions of professors throughout their careers.
- The rewards structure emphasizes the research role too much at the expense of educational and service roles.
- The rewards structure is driven too heavily by a general feeling of comfort in evaluating research in contrast to a lack of comfort in evaluating teaching and service.
- The rewards structure, especially at institutions with heavy teaching loads, overemphasizes traditional research at the expense of other forms of scholarship.
- The rewards structure tends to discourage those who wish to cross disciplinary boundaries.

Federal and state governments and university and college administrations can exert their influence on the mathematical sciences community through their own recognition and rewards systems. The professional societies can play useful and effective roles in advocating and supporting change. **But the main responsibility rests with individual departments of mathematical sciences, and it is to this group that our report is addressed.** Our Committee cannot and does not want to be prescriptive about what departments should do, in part because of the huge diversity of institutions with differing missions and goals, but also because addressing these issues is best done within the local culture. However, we call attention to problems departments are facing and give some guiding principles for the organization of the recognition and rewards structure.

FINDINGS

This section presents a number of the Committee's findings. First, we describe the activities—site visits, open forums, and a survey—that comprised the study which led to the findings.

Site visits were carried out in twenty-six institutions. These consisted of PhD-granting departments of mathematics and applied mathematics, institutions whose highest degree awarded in mathematics was a master's or a bachelor's, and two-year colleges (see accompanying box for further details). Three site visits were made to nonacademic institutions in order both to broaden our perspective and to make a comparison between these and academic institutions; the perspective obtained is implicit rather than explicit in the report. On the site visits, we interviewed as many of the faculty as was practicable, as well as the chair of the mathematics department and members of the administration including, when possible (which was usually the case), the Dean, the Provost, and the President of the institution. Each site visit team, consisting of two or three members of the Committee, spent one and a half days at the institution.

The institutions we visited represent a cross-section of colleges and universities, including both public and private institutions having a wide geographic distribution and serving diverse populations. The discussions tended to be informal, covering a broad range of topics, yet guided by a list of questions prepared in advance by the Committee. They were aimed at determining the current rewards structure at the institution, both the formal procedures and what was actually valued in practice, as well as determining where the institution was heading and how the individuals felt about this. All perspectives were heard—faculty, chair, and administration. Before each site visit, the department was sent a brief description of the Committee, its charge, a list of its members, and a list of the kinds of questions the Committee was interested in exploring. These visits were very educational for both the site visit teams and the institutions visited.

As part of the study, the Committee conducted discussions at meetings of the three JPBM societies for the purposes of creating a dialogue in the community about the rewards system, informing the community about the activities of the Committee, and gaining additional input for the Committee's study.

The Committee, aided by the assistant director of the University of Maryland's Survey Research Center, also conducted a survey. Two survey questionnaires were sent out, one to randomly selected, stratified samples of mathematical sciences faculty, and one to chairs of mathematical sciences departments. Most of the questions on the two surveys were the same. The sample populations were chosen to represent all departments, grouped by highest degree granted (doctorate, master's, bachelor's, and two-year programs). Doctorate-granting departments were further partitioned using the classification used by the Annual AMS-IMS-MAA Surveys (see the accompanying box).

Survey Populations

The abbreviations used in this report refer to surveyed samples chosen from the following groups of departments:

PhD-1 These are the 39 top-ranked doctorate-granting departments of mathematics in the U.S. (ranked by a 1982 assessment of research-doctorate programs in mathematics by the Conference Board of Associated Research Councils).

PhD-2 The 43 next ranked doctorate-granting departments of mathematics.

PhD-3 The remaining 86 doctorate-granting departments of mathematics.

PhD-5 Doctorate-granting departments of applied mathematics.

MA The 243 departments of mathematical sciences granting a master's degree as the highest degree.

BA The 964 departments of mathematical sciences granting a bachelor's degree as the highest degree.

2YR 900 two-year programs in mathematical sciences at community and junior colleges.

Response rates for the two surveyed groups (chairs and faculty):

	DEPARTMENT CHAIRS	FACULTY MEMBERS
PhD-1	82% (32 of 39 surveyed)	57% (128 of 224 surveyed)
PhD-2	91% (39 of 43 surveyed)	59% (111 of 188 surveyed)
PhD-3	74% (64 of 86 surveyed)	64% (237 of 373 surveyed)
PhD-5	79% (11 of 14 surveyed)	
MA	69% (104 of 150 surveyed)	58% (219 of 375 surveyed)
BA	75% (112 of 149 surveyed)	65% (199 of 305 surveyed)
2YR	76% (114 of 150 surveyed)	39% (114 of 291 surveyed)

This report contains survey data only if the magnitude of the effect is sufficiently high that, even if there is some bias in the responses received, it would not affect the qualitative results obtained. The Committee decided not to report survey data for the small number of applied mathematics departments, nor for two-year colleges because of the low response rate from the faculty in this group. Separate departments of statistics, operations research, and computer science were not surveyed.

Many of the survey questions were asked in two ways: we asked what was actually the case and what should be the case. For example, we asked both chairs and faculty "How important is classroom teaching in determining merit salary increases?" and then asked the same question with "is" replaced by "should be". Both of these questions were asked again to both chairs and faculty with "merit salary increases" replaced by "promotion and tenure". The choices given were "very important", "somewhat important", "somewhat unimportant", and "very unimportant". Extracted survey data are presented in this section.

A great deal more data were obtained on the survey than could be presented in this report. With regard to research, we asked how important it was, how the emphasis had changed, what were the incentives for doing it, whether it was evaluated and, if so, how it was evaluated. We asked similar questions for teaching and for service. We asked about the importance of interdisciplinary and applied research as well other items of scholarship such as research in mathematics education. We asked about the importance of student advising, thesis supervision, and curriculum development. Finally, we sought to assess the importance of competing offers and grants and contracts in determining rewards. The data from these and other questions, together with full descriptions of survey populations and methodology, are available in a supplement to this report, which may be obtained free of charge by contacting the American Mathematical Society, 1527 Eighteenth St., NW, Washington DC 20036 (tel: 202-588-1100, electronic mail: amsdc@math.ams.org).

FINDING I

There is a substantial gap between what faculty members think the rewards structure should be and what it actually is, as well as a desire for a broader and more flexible rewards structure.

Discussion

During the site visits, virtually everyone interviewed felt that research should, in general, continue to have maximal status in the rewards structure. However, there was also widespread belief that research should not drive the rewards system, as it currently does in many institutions. We were told that many faculty members are doing very important work for the department or institution but are not rewarded for it. For example, some stated that, compared to research contributions, curricular work of exceptional value is not rewarded commensurately with its value and does not carry the weight it should in rewards and recognition systems relative to research contributions. There was the feeling that all mathematical sciences departments need faculty who concentrate on the undergraduate program, and yet the rewards system in many places discourages faculty from doing so. Many faculty members want to see change, although exactly what change is desired varies with the institution, its mission, and its history.

During the site visits, virtually everyone interviewed felt that research should, in general, continue to have maximal status in the rewards structure. However, there was also widespread belief that research should not drive the rewards system, as it currently does in many institutions.

In addition, the survey asked about the importance of various activities in gaining merit salary increases, promotion, and tenure. Again, most agreed that research should continue to have high importance. However, in most other categories the percentage of faculty and chairs who said an activity should be an important factor was substantially higher than the percentage who said it already was an important factor. The categories where this phenomenon was evident were classroom teaching, service to the institution, service to the profession, service to the local community (such as working with public schools), interdisciplinary research involving new mathematics, applications of existing mathematics to other fields, research on educational issues, presenting colloquiums and seminars, expository writing, student advising, doctoral thesis supervision, master's and bachelor's thesis supervision, and curriculum development. In Figures 1, 2, and 3 we give examples of this phenomenon for the categories of teaching, service to the institution, and interdisciplinary research involving new mathematics. (By contrast, with respect to competing offers from other institutions and receipt of extramural grants and contracts, the percentage of faculty and chairs who felt that these should be important was considerably less than the percentage who felt they actually are important.)

Figure 1 indicates a wide discrepancy in how faculty members in PhD-I mathematics departments perceive the importance of teaching in determining merit salary

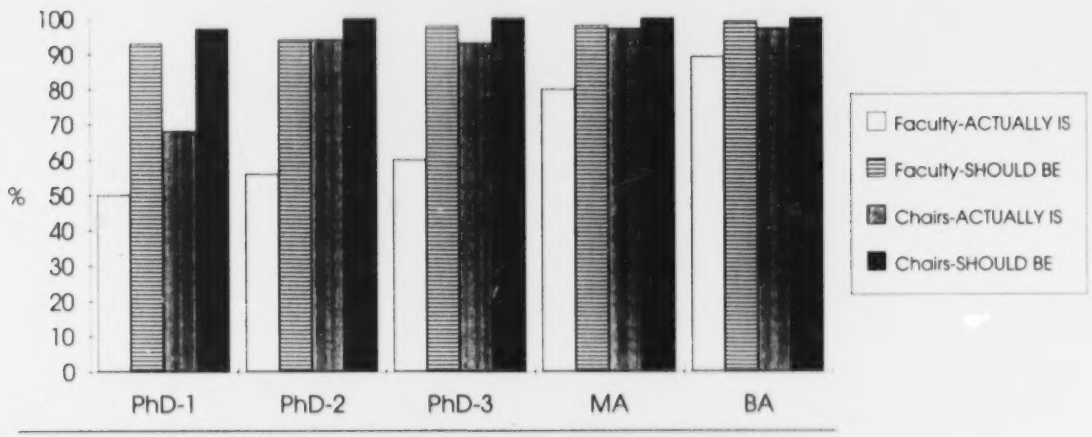

Figure 1. Percent rating TEACHING very or somewhat important for merit salary increases.

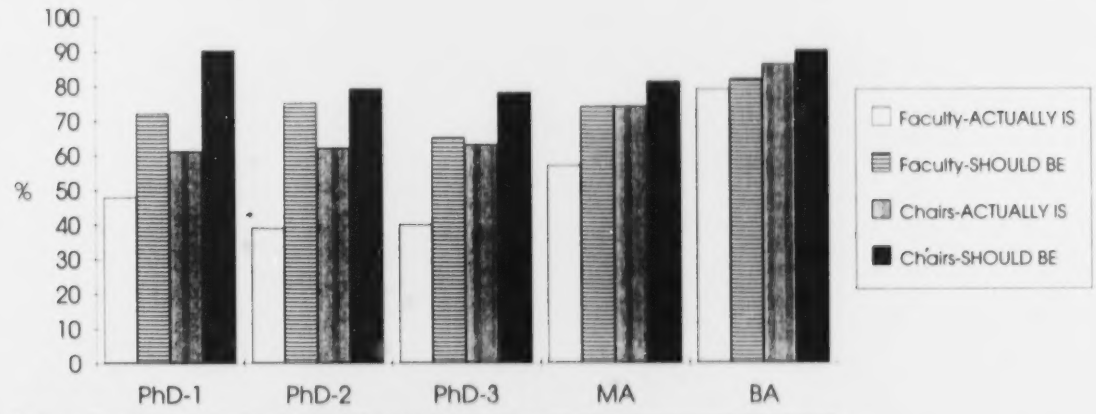

Figure 2. Percent rating SERVICE to the institution very or somewhat important for merit salary increases.

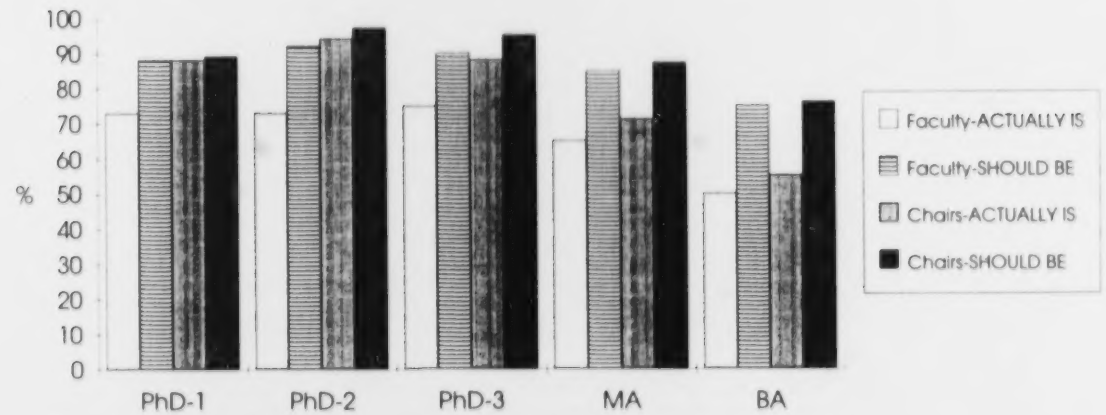

Figure 3. Percent rating INTERDISCIPLINARY RESEARCH involving new mathematics very or somewhat important for merit salary increases.

increases: 50% believe that teaching actually is important in determining merit salary increases, while 93% believe that it should be important. We see a similar, although not as striking, phenomenon in Figures 2 and 3.

The site visits revealed great dissatisfaction about inadequate rewards for faculty's educational responsibilities. Faculty strongly favored rewarding people for excellence in this area and felt equally strongly that under the current system this is not done as much as it should be. There was a high degree of consensus that these responsibilities include not only classroom presentations but also advising, consulting with students outside of class, preparing syllabi and tests, creating instructional materials such as software and visual aids, developing curricula, and the like.

The site visits revealed great dissatisfaction about inadequate rewards for faculty's educational responsibilities.

Two other points should be made. First, we noticed a tendency, especially when it came to promotion and tenure, for teaching to be an all-or-nothing variable. That is, if one met a certain minimum standard of teaching (which could be very high or very low, depending on the institution) then one's teaching had no further influence on the promotion or tenure decision; and if one did not meet this minimum standard, then promotion or tenure was unlikely. Second, the Committee found no evidence that the teaching was more effective in those departments that paid more attention to rewarding teaching than in those that did not. What we found was that faculty felt that teaching deserved a higher status in the reward structure than it had.

We observed during our site visits the wide diversity of duties that faculty members in mathematical sciences departments are called upon to perform. (This diversity was most apparent when compared to the much narrower focus of the mathematics sections in the industrial and governmental laboratories we visited.) Many of these duties, however, did not tend to be rewarded, even though they were generally performed well. Almost every faculty member and administrator we talked to was strongly in favor of rewarding a greater variety of professorial duties. The commitment to actually making changes, however, was stronger among administrators than among faculty. There was a general consensus that faculty members who change emphasis during their careers—for example, from research to education, or from research to other forms of scholarship—should be allowed to do so without being penalized by the rewards system.

Almost every faculty member and administrator we talked to was strongly in favor of rewarding a greater variety of professorial duties.

Although we found that educational work was rewarded less than research, most departments at all types of institutions had faculty who specialized in educational issues. Some departments had faculty positions reserved for individuals with degrees in mathematics education. However, in most departments, the positions devoted to education were filled in an ad hoc way, by faculty with degrees in mathematics who had moved the focus of their activities into education over the course of their careers. There was often variation in how faculty members who concentrated on educational issues were rewarded, even within a single department. For example, a person who continued a research career until later in life, gaining the rank of full professor before switching the focus of his or her activities to educational issues, would tend to fare much better in the reward structure than someone who had made the switch before being promoted to full professor. The Committee did see efforts to bring into the mainstream of the rewards system some of those who had shifted into mathematics education; in particular, attempts were being made to promote some of these faculty to the rank of full professor.

FINDING II

During the last five to ten years, there has been an evolution in mathematical sciences departments, with an increased emphasis on research and scholarship in the departments which traditionally emphasized their teaching roles, while at the same time there has been an increased emphasis on the teaching roles in the departments which traditionally emphasized their research roles.

Discussion

In site visits to BA, MA, and PhD-3 departments (and even to some extent in visits to departments at two-year colleges), we saw increased emphasis on research and scholarship in their rewards structures and in their expectations, especially of junior faculty. This trend was not uniform and in some instances changed with changing administrations, but the direction was clear. There were even some cases where teaching loads had been reduced to accommodate this new emphasis. Some of these changes were recent enough to cause consternation among junior faculty members over exactly what was expected of them in order to gain tenure and whether these expectations were changing as they progressed toward tenure. One of the striking things we found in the site visits, which may be part of the driving force behind this increased emphasis on research and scholarship, was that, at schools of all types, many junior faculty members were exceptional individuals who were not only excellent teachers and good researchers but also capable of assuming leadership roles in their departments. It was difficult to determine why this was so. Perhaps today's tight job market allows departments to hire at a very high level of competence, or perhaps graduate students are better prepared and have broader interests.

In site visits to BA, MA, and PhD-3 departments ... we saw increased emphasis on research and scholarship in their rewards structures and in their expectations, especially of junior faculty.

We also saw on our site visits an increased emphasis on teaching at the research universities. Although more evident in the rhetoric than in the actual policies, this emphasis is definitely working its way into the rewards structure. The leadership on this issue usually came from the administration, but support was also strong among the faculty. Some institutions were trying to open up the promotion process to people with exceptional teaching service who had given up doing any research. In other places, full professors with good research records who had moved into education were still very well treated in the rewards system. Some places were hiring and promoting (or at least holding out the strong possibility of promotion to) people who had specialized in teaching all along. The research departments felt in general that this was an important development, but, remaining cognizant of their primary research mission, were struggling to ensure that both these activities remained strong and healthy.

We also saw on our site visits an increased emphasis on teaching at the research universities.

The survey data provide additional evidence of these changes. We asked the question, "In determining merit salary increases, are the following activities valued more or less now than they were five years ago?" The three activities were research, teaching, and service. A similar question was asked for "promotion and tenure". The PhD-1 and PhD-2 departments did not report much change in the emphasis on research. However, MA and BA departments reported increased emphasis on research. With respect to emphasis on teaching, roughly 50% (somewhat more in the BA departments) of the chairs and faculty in all types of departments saw no change in the emphasis on teaching. Nevertheless, the PhD departments showed a significant increase in emphasis on teaching. All of these perceptions were markedly stronger among the chairs than among the faculty. Figures 4 and 5 show the differences between the numbers who saw an increase in emphasis and those who saw a decrease.

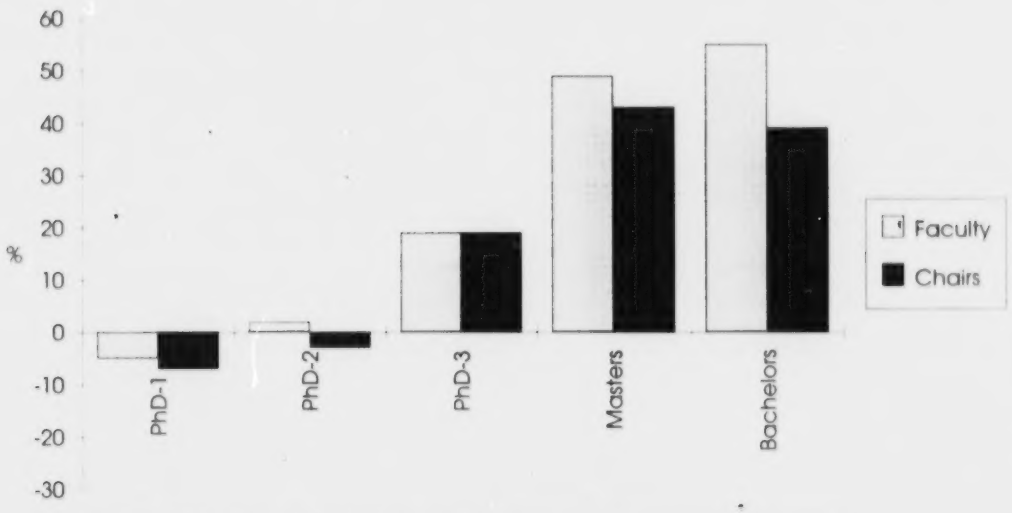

Figure 4. Percent difference between those reporting that RESEARCH is valued more now for merit salary increases and those reporting it is valued less now than five years ago.

Table 1.	PhD-1 %	PhD-2 %	PhD-3 %	Masters %	Bachelors %
Faculty-change	-5	2	19	49	55
Faculty-no change	78	65	53	35	35
Chairs-change	-7	-3	19	43	39
Chairs-no change	85	75	78	40	58

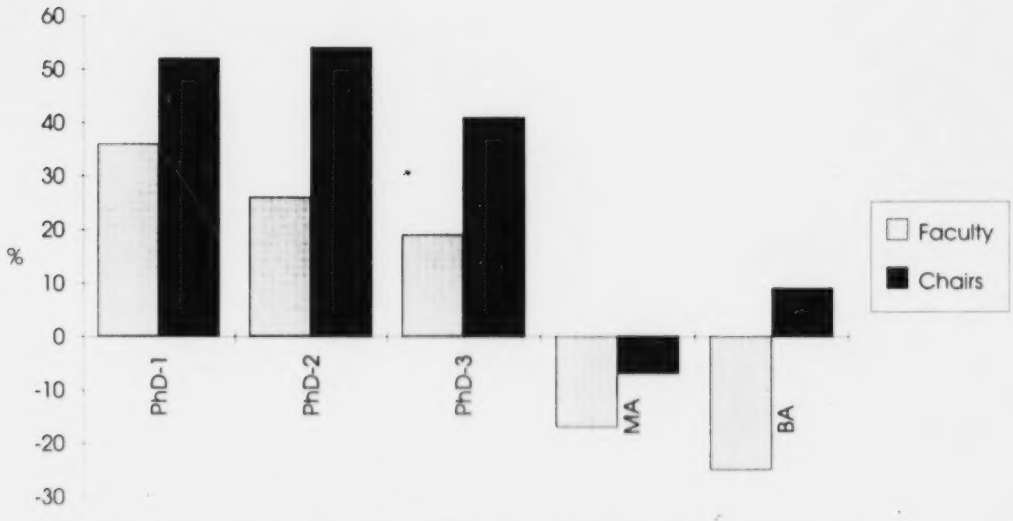

Figure 5. Percent difference between those reporting that TEACHING is valued more now for merit salary increases and those reporting it is valued less now than five years ago.

Table 2.	PhD-1 %	PhD-2 %	PhD-3 %	Masters %	Bachelors %
Faculty-change	36	26	19	-17	-25
Faculty-no change	50	46	52	49	60
Chairs-change	52	54	41	-7	9
Chairs-no change	41	46	49	50	74

FINDING III

Survey results from questions about the importance of three different types of mathematical sciences research for the rewards structure indicate that "research in the discipline" was almost universally seen as very important, and that it should be very important. Results also indicated that "interdisciplinary research involving new mathematics" and "applications of existing mathematics to other fields" were seen as important, but not as important as "research in the discipline".

Discussion

Our survey asked faculty and chairs about the importance of three different types of mathematical sciences research in decisions about promotion, tenure, and merit salary increases. The three types of research were: "research in the discipline", "interdisciplinary research involving new mathematics", and "applications of existing mathematics to other fields". In the doctorate-granting departments, faculty and chairs were in virtually unanimous agreement that research in the discipline is and should be important for both types of rewards, with almost all rating it in the "very important" category. These ratings remained high in the MA and BA departments. (See Figure 6.) There was also strong agreement that "interdisciplinary research" should be important, but much of that support is in the "somewhat important" rather than the "very important" rating. (See Figure 7.) Support for rewarding "applications of existing mathematics to other fields" is weaker, but still high, and even more of this support is in the "somewhat important" rating. (See Figure 8.)

On the site visits, we noticed a widespread view that research meant publications in refereed journals and receipt of grants. In most departments, we did not perceive strong feelings that, of the three kinds of research named above, one was much more appreciated than others. However, in a few departments, some individuals disparaged research applied directly to other subjects. Of course, in some institutions, this issue has actually led to a splitting of the mathematics department into two separate departments.

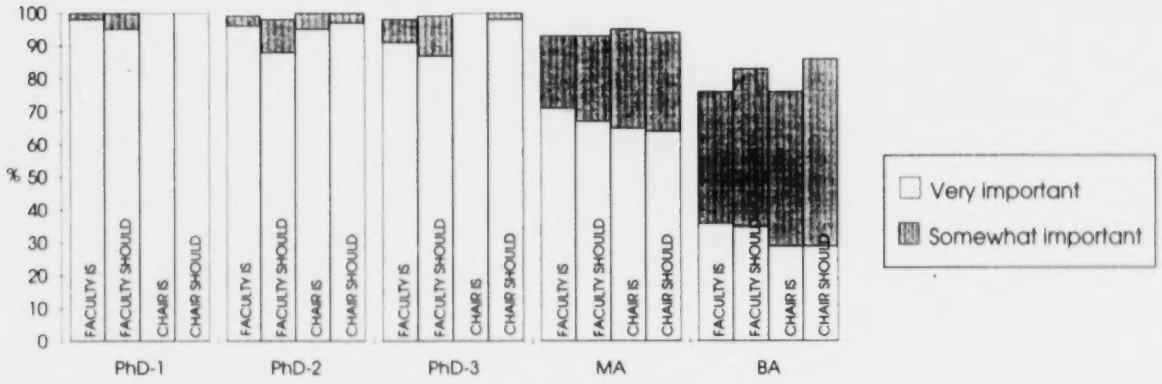

Figure 6. Percent rating RESEARCH IN THE DISCIPLINE important for promotion and tenure.

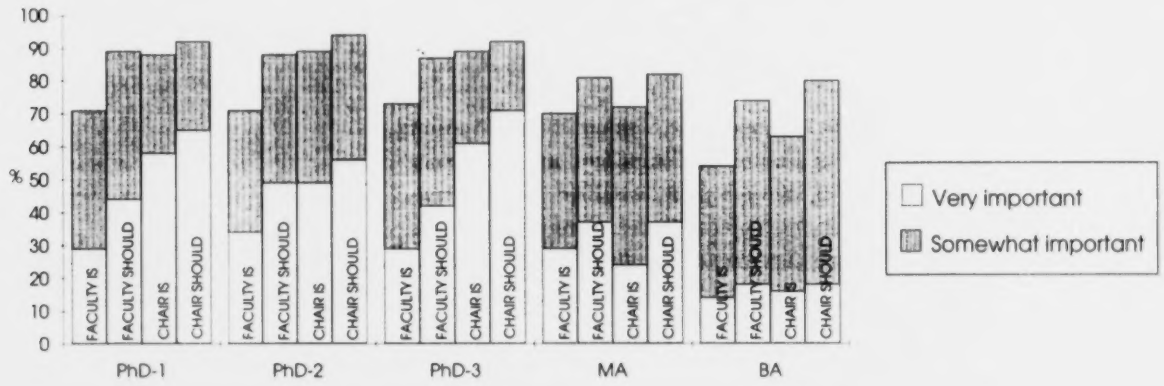

Figure 7. Percent rating INTERDISCIPLINARY RESEARCH INVOLVING NEW MATHEMATICS important for promotion and tenure.

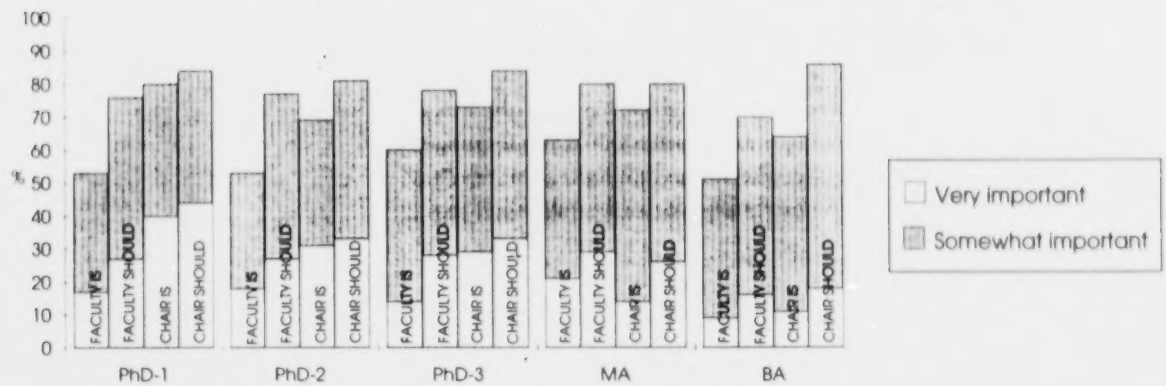

Figure 8. Percent rating APPLICATIONS OF EXISTING MATHEMATICS important for promotion and tenure.

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FINDING IV

There is ambiguity and uncertainty in the mathematical sciences community about what should be included in the definition of scholarship.

Discussion

We found on our site visits that most mathematical sciences departments do not have a working definition of scholarship. Although many of the faculty, chairs, and administrators we talked to would like to have a definition appropriate to their particular institutions, there has been little or no effort actually to develop one. This ambiguity about what is meant by scholarship was most pronounced in the institutions where teaching was most emphasized. There was general agreement that publishing traditional research articles in refereed journals was a legitimate, and even preferred, form of scholarship. At research institutions, the definition of scholarship was often restricted to such publishing, thus accounting for less ambiguity in those institutions.

We found on our site visits that most mathematical sciences departments do not have a working definition of scholarship.

We found widespread agreement that some form of scholarship is desirable. A number of characteristic phrases were used in this connection, such as "evidence of intellectual vitality", "intellectually alive", "active alert mind which translates into excitement in the classroom", and "good teaching requires active engagement with the discipline". Vague definitions of scholarship, such as "intellectual activity that is exportable outside one's own institution" were sometimes used, often with the caveat that the work must be refereed. In teaching-oriented departments, or sometimes for more senior mathematicians, the definition might be broadened to include developing educational materials such as software, conducting pedagogical research, delivering papers at conferences, and writing expository papers, textbooks, and book reviews. Some departments broadened this further to include the application of knowledge to solving problems in one's local community, the nation, or the world, indicating that greater community involvement is a form of scholarship. In some departments, intellectual activities such as participating in conferences and workshops are viewed as scholarship.

The survey asked whether certain activities that might be viewed as scholarship were or should be valued in the reward structure. The activities were "research on educational issues", "expository writing", "presenting papers at conferences", and "presenting colloquiums and seminars". The latter two activities could be interpreted as doing traditional research and presenting it in formats different from refereed journals, while the former two are more properly connected with the question of breadth of the definition of scholarship. Figures 9–12 show that the support for the latter two is higher than the former two. In addition, the support for all of them falls mainly in the "somewhat important" ranking.

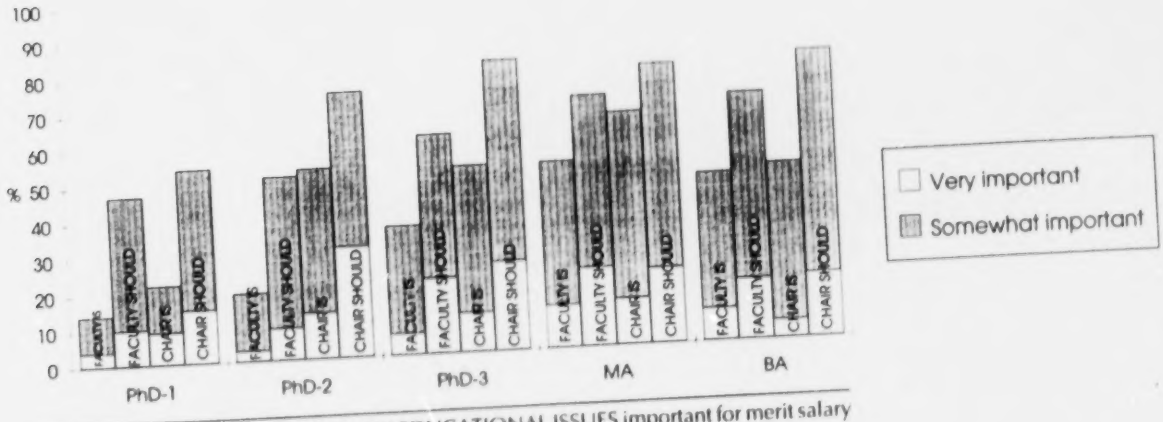

Figure 9. Percent rating RESEARCH ON EDUCATIONAL ISSUES important for merit salary increases.

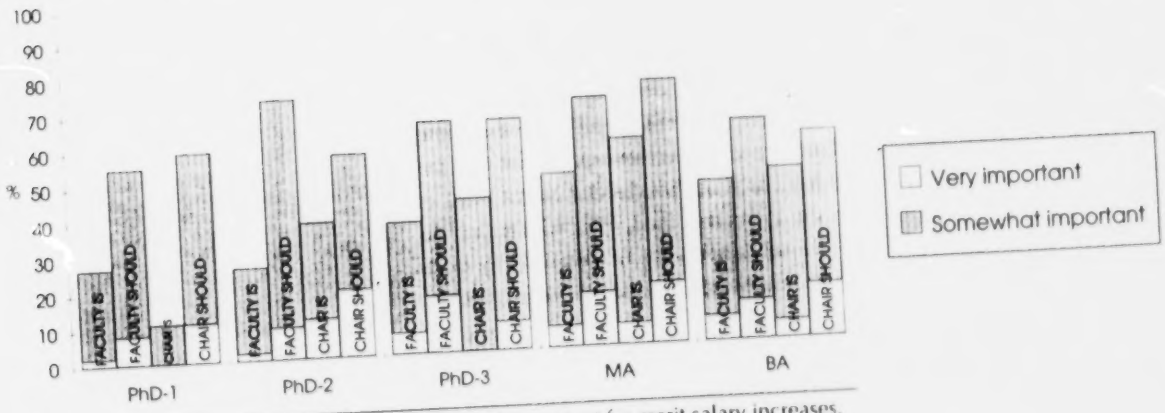

Figure 10. Percent rating EXPOSITORY WRITING important for merit salary increases.

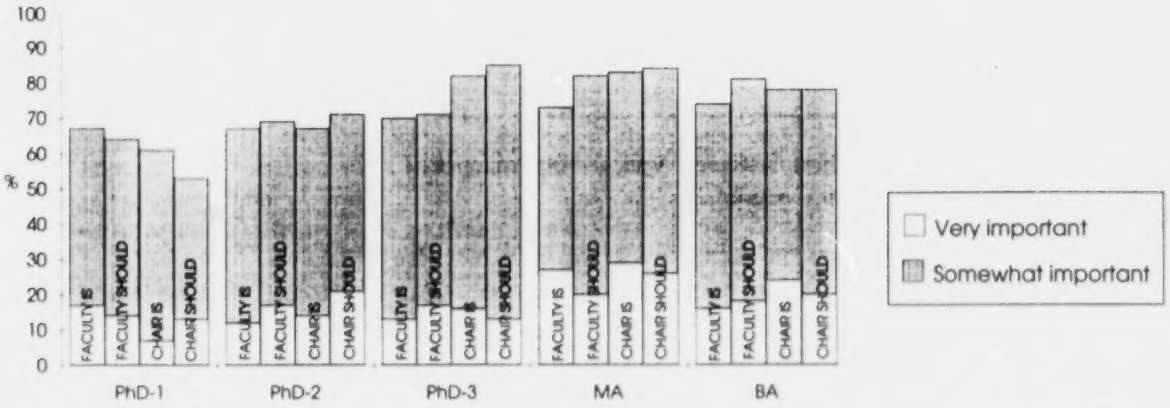

Figure 11. Percent rating PRESENTING PAPERS AT CONFERENCES important for merit salary increases.

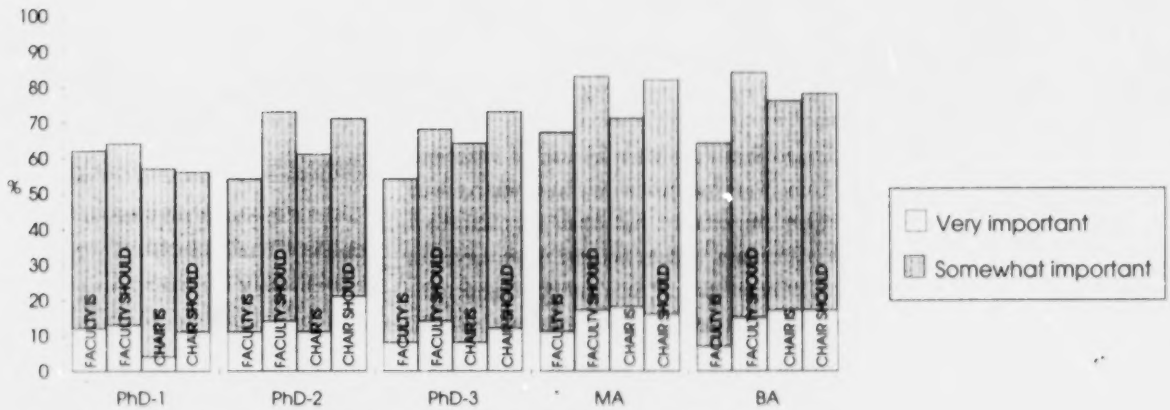

Figure 12. Percent rating PRESENTING COLLOQUIUMS OR SEMINARS important for merit salary increases.

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FINDING V

Lack of effective communication between various organizational levels is a major problem at many institutions.

Discussion

One important problem we found on our site visits was the lack of effective communication. This problem arose at all organizational levels—between the administration and the department, between the deans and upper administration, between the chair and the faculty, between the chair and the administration. It showed up in misunderstandings between groups, in subtle conflict of values, and in unclear definitions of what was valued or expected. It was apparent in a frequently observed lack of a clear, common understanding of the relative values that institutions placed on teaching, research, and service. We saw the problem in institutions in which official policies were carried out in very different ways at different levels of the administration, and in general disparity between policy and practices. We also saw it in differences between the goals of the institution and the national or local agenda.

Nontenured faculty members complained that they were unsure of what was expected of them in order to gain tenure. Some were told when they were interviewed for their jobs that teaching was of paramount importance, but when they arrived it appeared the only issue was their research production. If they became too involved in the education program, they were warned to be careful about their publication records. One assistant professor told us that teaching was absolutely the main consideration in the tenure decision, while another in the same department told us the main consideration was research. At some of the BA departments, assistant professors would be told that institutional service was mandatory, but no one seemed to check whether any was actually being done. Sometimes one would find that the department held one set of criteria and the administration held another, each being used for the judgement at that particular level. This ambiguity was more prevalent at the PhD-3, MA, and BA institutions. But at all institutions, it was unclear how much teaching would count. On the other hand, at the institutions we visited, in spite of this ambiguity, we found very few cases where tenure was actually denied for any reason.

One assistant professor told us that teaching was absolutely the main consideration in the tenure decision, while another in the same department told us the main consideration was research.

In some institutions we visited, the mathematics department was seen by the administration as one of the best and most responsive to the needs of the institution, while at others there were deep conflicts between the two. In some places, it was apparent that the department and the administration were working on totally different agendas, and neither knew what the other's was. Some institutions were grappling with the problem of high failure rates among underprepared students who were taking mathematics

In some places, it was apparent that the department and the administration were working on totally different agendas, and neither knew what the other's was.

courses. At one school, the administration saw the department as a group of uncaring elitists who could not understand that not everyone can grasp the concepts as easily as they can; at the same time, the administration was unaware of what the department was doing to improve its lower-level teaching. Often departments had a great deal of difficulty making their administrations understand the special problems associated with teaching mathematics. On the other hand, some departments seemed unable or unwilling to come to grips with the political and fiscal problems the administrations faced over retention of undergraduate students.

On some of our site visits, we witnessed the difficulties that can arise when change comes about in the upper administration of an institution, especially when a new president is hired. Often it took a few years for the administrations to redefine their directions and policies, and during this time departments were often uncertain about what the new directions would be or what impact the new policies would have. Given the high turnover rate in academic administrative positions in recent years, this problem occurs more often than one might think.

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FINDING VI

A. The role of the chair is critical to the well-being of the department.
B. There are marked discrepancies between the answers of the chairs and faculty on many questions in the survey.

Discussion

We found the fewest communication problems in institutions with the most effective chairs—people with the ability to bridge the gap in perspectives between the two groups. The chair of a mathematics department has a greater influence over the well-being of the department than any other administrator or faculty member. Chairs are of crucial importance in minimizing the communication problems discussed in Finding V. A chair must communicate effectively to the administration the special problems the department faces in its teaching and research functions, while also communicating the administration's point of view to the faculty.

The chairs are in a particularly delicate position, being at the interface of the teachers and scholars and the administrators, and it is sometimes unclear to which group they belong. There is often a great deal of ambiguity and misunderstanding concerning the role of the chair, and it is not uncommon for two successive chairs to have quite different views on what this role should be. They have a substantial amount of power in setting the directions for any changes in the department. Unfortunately, chairs commonly have no systematic training to prepare them for this role.

The chair of a mathematics department has a greater influence over the well-being of the department than any other administrator or faculty member. ... Unfortunately, chairs commonly have no systematic training to prepare them for this role.

A major finding in the survey was the consistent difference in the perceptions of the chairs and faculty. Generally, the difference was that, for a given activity, a larger percentage of the chairs than faculty said the activity was rewarded, and a larger percentage of chairs than faculty said it should be rewarded. There was a tendency for what the faculty said should be important to be close to what the chairs said already was important. The reader can see these discrepancies in many of the charts and graphs in this report. For example, Figures 13 and 14 show that a much higher percentage of chairs believed that differences in research or teaching effectiveness were truly reflected in salary differences. Another example is found in Tables 3 and 4 on the perceived incentives for faculty to perform their various duties well.

After seeing these marked differences in perception on the survey, we wondered: Do the chairs have a better sense of what is really happening in their departments and institutions? Curiously, this difference emerged only on the survey, not in the site visits.

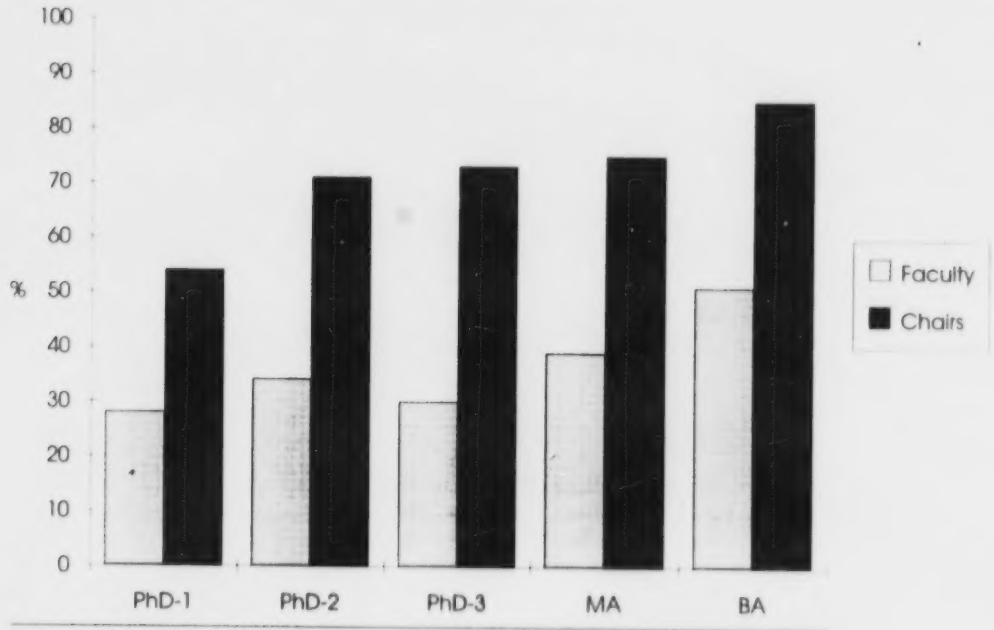

Figure 13. Percent responding that salary reflects difference between excellent and average TEACHING.

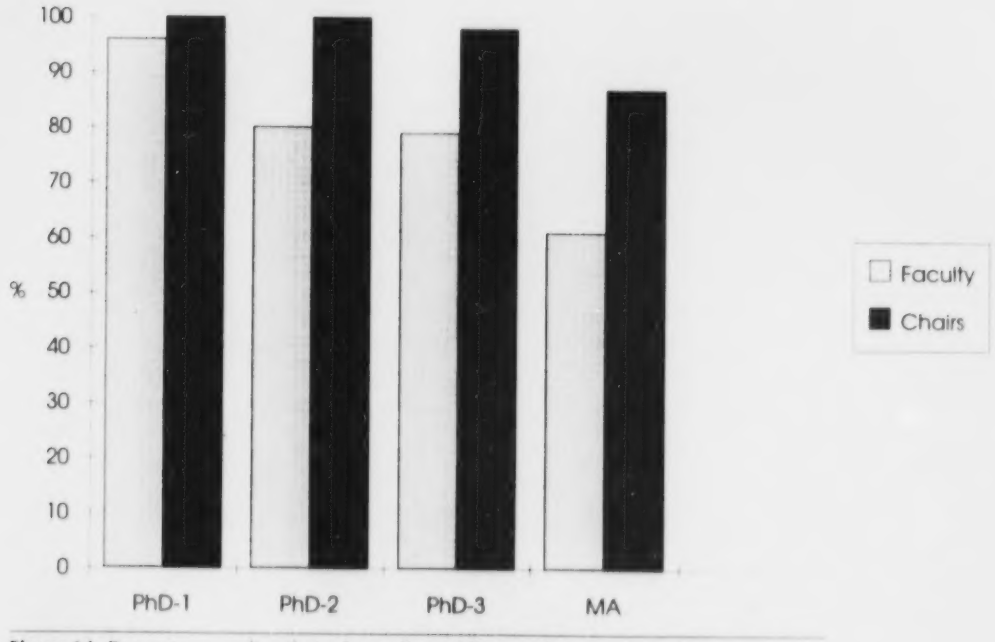

Figure 14. Percent responding that salary reflects difference between excellent and average RESEARCH. (Bachelor's department sample size too small to report.)

Table 3. As incentives for good teaching:

	PhD-1		PhD-2		PhD-3		Masters		Bachelors	
	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %
PROMOTION & TENURE										
Major or moderate	30	64	42	89	51	89	53	94	64	85
Major	8	18	15	28	17	42	19	53	21	54
SALARY INCREASES										
Major or moderate	22	48	38	67	48	61	48	69	54	62
Major	6	11	10	31	12	20	18	32	22	24

Table 4. As incentives to do research:

	PhD-1		PhD-2		PhD-3		Masters		Bachelors	
	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %
PROMOTION & TENURE										
Major or moderate	55	100	70	100	75	100	71	96	72	79
Major	38	100	45	95	52	92	38	78	32	44
SALARY INCREASES										
Major or moderate	70	94	72	92	76	94	58	85	58	57
Major	32	71	42	79	37	61	28	53	22	23

FINDING VII

There is general dissatisfaction with the methods of evaluating teaching, especially student evaluation questionnaires on teaching.

Discussion

On our site visits, we found a great deal of tension and confusion over the lack of clear criteria for effective teaching. There was also widespread belief that evaluating teaching effectiveness is very difficult. The lack of accepted mechanisms for such evaluation emerged as a fundamental stumbling block in efforts to increase the importance of teaching in the rewards structure. Even in institutions where teaching was heavily weighted, there was a tendency to rank all faculty more or less equally so that, for example, no real salary differentials came about as a result of teaching activities.

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The student evaluation questionnaire was the single most frequently used measure of teaching effectiveness—and the one which received the most criticism. Departments usually concentrated on the one question common to all such questionnaires, namely, whether the instructor did a good job in teaching the course. The results of this question were viewed by most faculty more as a measure of how happy students were with the course than as a measure of the effectiveness of the teacher. As one faculty member put it, "If the student fails, I fail." Because of results on student evaluations, one professor at a research university varied in different years from being eligible for a commendation for teaching excellence to being called before the chair for substandard teaching. One mathematics department, which had an excellent reputation with the administration and the students for its teaching, made the decision (extremely controversial within the department) to disallow any student input on evaluations of teaching.

The student evaluation questionnaire was the single most frequently used measure of teaching effectiveness—and the one which received the most criticism.

The suspicion of the validity of student evaluations was as deep among faculty who concentrated solely on teaching as it was among the more research-oriented professors. Even in an institution where the administration claimed their research showed that more homework and harder courses correlated positively with positive student ratings, the negative reactions of the mathematics faculty toward student evaluation were as pronounced as anywhere else. Of particular concern among mathematical sciences faculty is the tendency of administrations to compare student teaching evaluations of required lower-level mathematics courses with evaluations of teaching in elective courses in the humanities and social sciences.

Some departments used other methods of evaluating teaching: peer evaluation, exit interviews with graduating seniors, polling of alumni, review of syllabi and examinations, evaluation of student performance in subsequent courses, and informal "reputa-

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tion" of the teachers. These measures, and whatever else one can think of, are sometimes used to compile a "teaching portfolio". In general, there seemed to be more satisfaction with evaluating teaching in places that used multiple means of evaluation, although some feared that they could end up spending more time worrying about evaluation than teaching.

In the survey we asked faculty and chairs whether certain methods were used in the evaluation of teaching in their department. Table 5 summarizes their responses.

Table 5. Importance in evaluation of teaching.

	PhD-1		PhD-2		PhD-3		Masters		Bachelors	
	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %
STUDENT EVALUATION										
Somewhat or Very	95	97	95	100	96	98	98	97	96	96
Very	60	59	78	74	66	73	71	76	73	74
OBSERVATION BY PEERS										
Somewhat or Very	46	61	40	61	34	50	46	56	64	66
Very	15	25	10	11	10	15	22	34	28	29
INFORMAL EVALUATION BY PEERS										
Somewhat or Very	50	61	45	68	48	62	46	62	67	70
Very	13	4	12	16	11	13	10	15	24	25
EVALUATIONS BY PAST STUDENTS										
Somewhat or Very	18	11	31	43	22	33	27	29	36	36
Very	8	4	10	19	4	7	5	5	9	7
SELF-EVALUATION										
Somewhat or Very	11	28	6	24	14	20	33	46	46	67
Very	4	8	1	5	4	3	9	11	16	28
ACHIEVEMENT OF FORMER STUDENTS										
Somewhat or Very	22	35	14	38	20	31	22	38	26	31
Very	4	12	1	11	2	3	2	5	2	1
CLASSROOM MATERIALS										
Somewhat or Very	10	7	8	30	13	24	24	41	35	38
Very	1	0	2	5	1	2	4	7	4	5
GRADING PRACTICES										
Somewhat or Very	15	25	22	35	19	31	25	41	31	31
Very	4	0	3	5	1	0	2	3	4	1
WORK WITH STUDENTS outside of class										
Somewhat or Very	35	68	36	68	35	71	54	88	69	86
Very	4	7	5	14	4	8	11	30	21	30

FINDING VIII

There is discomfort with the evaluation of faculty duties in general.

Discussion

Our site visits revealed that the methods of evaluation of most faculty duties either are felt to be questionable or are nonexistent. For example, when it comes to evaluating teaching, there is a tendency to concentrate on evaluating classroom performance, presumably because of the almost universal use of student evaluation questionnaires. However, it is generally acknowledged that one's teaching duties extend well beyond classroom teaching to other activities, such as curriculum development, advising and mentoring students, and outreach to underrepresented groups. These activities were seldom formally evaluated, and there were no agreed-upon criteria for making such evaluations.

Our site visits revealed that the methods of evaluation of most faculty duties either are felt to be questionable or are nonexistent.

The one evaluation faculty and administrators generally felt the most comfortable with was that of published research in refereed journals. The fact that the editor and referee have approved a paper for publication was viewed as a reasonable evaluation of the work. But even this came under attack in some quarters. It was felt that a certain amount of publication, as well as invitations to conferences and giving colloquiums and seminars, could be achieved through cronyism. Also, this method of evaluation was often derisively put down as simple "paper counting". Be that as it may, when one moves into other activities that might come under the heading of scholarship, there was no generally agreed-upon means of evaluation. Moreover, with regard to service, there was usually not even an attempt formally to measure effective work. Most administrators said they would like to have guidance in these areas.

The lack of such evaluation mechanisms is seen as a major obstacle to broadening the rewards structure.

The lack of such evaluation mechanisms is a major obstacle to broadening the rewards structure.

The survey asked faculty and chairs whether teaching, research, and service were evaluated in their departments. Virtually every department said that teaching was evaluated. Moreover, at all types of institutions, the percentage saying that teaching was evaluated was uniformly higher than the percentage saying that research was evaluated. The percentages saying that service was evaluated was much lower. We also asked what kinds of things were measured in evaluating teaching and research. (See Table 5 for data on evaluation of teaching, and Table 6 for research.)

Table 6. Importance in evaluation of research.

	PhD-1		PhD-2		PhD-3		Masters		Bachelors	
	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %
NON-REFEREED PUBLICATIONS										
Somewhat or Very	39	40	32	32	30	22	46	36		
Very	5	8	3	0	3	0	4	6		
REFEREED PUBLICATIONS										
Somewhat or Very	98	100	99	100	100	100	99	99		
Very	92	88	97	95	94	100	92	95		
CITATIONS										
Somewhat or Very	41	21	42	44	37	42	43	41		
Very	15	8	9	11	8	3	12	11		
GRANTS, CONTRACTS ETC.										
Somewhat or Very	93	73	99	97	94	98	92	90		
Very	61	23	75	76	72	62	51	48		
CONFERENCE PRESENTATIONS										
Somewhat or Very	79	58	82	82	80	92	86	92		
Very	26	19	18	32	15	17	23	25		

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FINDING IX

"Quality of life" issues are of major importance in any rewards structure.

Discussion

The discussions we had on our site visits revealed the importance that faculty members attach to one reward that was generally called the "quality of life" in the department. In one department we visited, where the quality of life was considered quite low, one professor said, to the general agreement of the colleagues present, that an improvement on this issue would be worth more than any salary raise he could conceive of. Congeniality within the faculty (that is, little internal dissension) is considered one of the primary quality of life issues. For example, institutions with little or no merit salary structures generally had congenial faculties. They felt that introducing merit salary increases into the rewards system would generate unwanted competition within the faculty. Moreover, they felt that, however unfair a flat salary scheme might seem to some faculty, a merit salary structure would cause considerable deterioration in the quality of life in the department, which in the long run would be a disservice to the faculty, the students, and the teaching program at the institution.

The discussions we had on our site visits revealed the importance that faculty members attach to one reward that was generally called the "quality of life" in the department.

Quality of life rewards take many forms, tangible and intangible, and usually are things that affect the department as a whole. Tangible rewards might include the physical plant (offices, classrooms, parking), sufficient clerical help, sufficient faculty to carry out the academic programs, recognition mechanisms such as teaching awards, adequate computer facilities, good undergraduate students, and sufficient numbers of qualified graduate students. Intangible rewards include a congenial department, respect from the administration and from colleagues outside mathematics, adequate cooperation for and the freedom to pursue departmental ventures, good communication between the administration and the department, flexible yet consistent expectations of the department by the administration, and appreciation from colleagues and from the chair.

The most common reason for low quality of life in departments was lack of appreciation of the department by the administration. The tangible rewards to the faculty might be quite good, yet morale might be low because faculty felt they were not valued. Often the problem was poor communication between the department and the administration, an issue which is discussed more fully in Finding V.

The most common reason for low quality of life in departments was lack of appreciation of the department by the administration.

FINDING X

Most faculty members favor a rewards system that includes a combination of across-the-board and merit increases.

Discussion

The site visits showed that the way salary raises were determined was very much tied to the quality of life in departments. Among departments having no merit salary raises (all raises were distributed evenly, usually by percentage of one's salary), not one wanted to change this, even when the administration favored change. They felt strongly that their incentive for good teaching, scholarship, or service was not higher salaries. One chair at a two-year college went so far as to say that he would not want to hire anyone who needed merit money to perform well.

The site visits showed that the way salary raises were determined was very much tied to the quality of life in departments.

However, the institutions we visited with across-the-board salary policies were in the minority, concentrated primarily in two-year and BA schools. In institutions that used merit salary increases, we found virtually no one who wanted to move to a flat salary scale (although some said they could see the advantage of such a pay scheme in promoting congeniality within the faculty). On the other hand, very few faculty wanted a salary policy based solely on merit, though the idea of such a policy was more popular among administrators.

The survey asked faculty and chairs, "Which of the following approaches for salary increases do you prefer?" The choices were: "across-the-board increases for everyone", "increases based solely on merit", or "combination of across-the-board and merit". The data in Table 7 show that most preferred a combination of across-the-board and merit increases.

TABLE 7. Preferred method for salary increases.

	PhD-1		PhD-2		PhD-3		Masters		Bachelors	
	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %	Fac %	Chr %
Across-the-board	2	0	5	3	3	3	18	18	23	16
Merit based only	17	13	10	26	10	15	7	9	5	7
Combination	81	87	84	72	87	82	75	74	72	77

RECOMMENDATION & GUIDING PRINCIPLES

After reflecting on its study and findings, the Committee discussed at some length a wide variety of possible recommendations. We came to the conclusion that, given the enormous diversity of institutions of higher education and departments, only one general recommendation could be made:

> The recognition and rewards system in mathematical sciences departments must encompass the full array of faculty activity required to fulfill departmental and institutional missions.

We learned from our study of the rewards structure that this perhaps self-evident recommendation is being implemented in only a small number of departments, and only a somewhat larger number are even beginning to grapple with the issues it entails. There is a clear need for departments to implement the changes that are required to achieve the goal stated in the recommendation. To this end, we offer the following six Guiding Principles to assist faculty and chairs.

Guiding Principle I

Research in the mathematical sciences and its applications is fundamental to the existence and utility of the discipline and should continue to be among the primary factors of importance in the recognition and rewards system.

Discussion

The accomplishments in mathematical research in the last twenty-five years have been truly remarkable. Numerous new branches of the subject have developed, while seemingly rigid boundaries between subfields have given way to robust cross-fertilization. The merging of what earlier were considered distinct fields has contributed to the solution of a number of famous, longstanding problems in core mathematics. Similarly, major breakthroughs have been made in various fields of applied mathematics. Moreover, core and applied mathematics have continued to enrich one another. In addition, mathematical methods and constructs are increasingly important in science, engineering, business, and industry, and problems arising from these sources are enriching the field.

The mathematical sciences must be internally strong. It also must have lively connections to other disciplines and to business and industry. Otherwise, many activities of the mathematical sciences community—such as teaching mathematics, curriculum development, expository writing, research in mathematics education, and many others—would lose the basis on which they rest. Research must therefore continue to be among the most important components of the rewards system.

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The Committee believes that no distinction should be made in the rewards system between research in the core areas of mathematics and that in applied areas. For example, much research in computational and applied mathematics is essentially the same as research in traditional mathematics, with both centering on the construction of new theory. However, these nontraditional areas are characterized by activities that are unusual in traditional mathematics departments, such as interdisciplinary research leading to publications with numerous authors, numerical experimentation that is not documented in traditional journals, and development of large computer codes that take years to complete, that are used primarily for simulation studies and/or design decisions, and that often have nontraditional methods of dissemination. The rewards structure needs to be sensitive to these differences.

The Committee believes that no distinction should be made in the rewards system between research in the core areas of mathematics and that in applied areas.

Interdisciplinary research (such as mathematics in materials science, mathematics in biology, mathematics in environment sciences, mathematics in industry, to name a few areas) requires a large investment of time and effort in learning new subjects and in

developing a project before any results can be achieved. Departments that wish to encourage interdisciplinary research must recognize these difficulties and adapt the rewards system accordingly. We believe that, for interdisciplinary research to thrive, there must be a means for making joint appointments with other departments, with joint evaluations. This can be a thorny issue, since universities tend to be sharply organized along departmental lines. The central administration, deans, and chancellors can play a constructive role here.

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Guiding Principle II

Each department should ensure that contributions to teaching and related activities and to service are among the primary factors of importance in the recognition and rewards system.

Discussion

Different departments place different amounts of emphasis on research, depending on the departmental and institutional missions. In all departments, however, the teaching function should be viewed as a primary responsibility of all faculty and should be rewarded and recognized accordingly. Teaching the next generation of those who need to use mathematics is not only one of the most fulfilling activities of a faculty member, it is also fundamental to the existence of the discipline. This responsibility extends far beyond the professor's time in the classroom to include curriculum development, advising, contributing to the training of graduate students, and other instructional activities.

In all departments ... the teaching function should be viewed as a primary responsibility of all faculty and should be rewarded and recognized accordingly. ... [teaching] extends far beyond the professor's time in the classroom ...

For example, revitalizing and reforming undergraduate mathematics education is one of the principal challenges facing the profession today. Much of great value has already been accomplished and there is a marked increase in faculty interest in and excitement about these issues. The wide availability of the computer and the growing awareness of the opportunities for innovation that it provides add to the interest and excitement. Departments should encourage experiments in teaching and see to it that no unnecessary obstacles are placed in the way of innovative or nontraditional approaches. In addition, departments should communicate the importance of teaching by making formal efforts to help faculty and graduate students improve their teaching. This can be done by having those who are acknowledged to be superb teachers help others improve, or by calling upon campus resources (such as centers for teaching).

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Two-year colleges have an especially long history of interest in and experience with successful teaching, especially with teaching underprepared students. Increasing numbers of students start their mathematics education at two-year schools and later transfer to baccalaureate institutions. For these reasons, we encourage more cooperation between two- and four-year schools through transfer agreements and joint course planning.

Departments and institutions cannot survive without faculty who are willing to take on substantial service responsibilities. These include chairing the department, managing the undergraduate or graduate programs, managing the advising program, serving on departmental and institutional committees, preparing graduate students for the realities of the jobs they will fill inside and outside academia, recruiting and mentoring

minority and women students and scholars, and assuming leadership roles based on professional expertise in the local community, and especially in the K–12 schools, or in professional organizations. These duties—all of them essential to the health and well-being of the institution and to mathematics in general—should be valued as important components of the recognition and rewards system.

... [service] duties—all of them essential to the health and well-being of the institution and to mathematics in general—should be valued as important components of the recognition and rewards system.

Guiding Principle III

Departments should develop policies that encourage faculty to allocate their efforts in ways that are as consistent as possible with their current interests and, at the same time, fit the needs of the department. The goal should be to create a department that meets all its obligations and aspirations with excellence, while at the same time engaging faculty in activities that they find personally rewarding. These activities should be recognized as valuable, and they should be rewarded when done well.

Discussion

The various duties of a department should be seen as a shared or corporate responsibility of the entire department. These duties include teaching, scholarship, advising, curriculum development, faculty development, mentoring young faculty, recruitment, service to the institution, and working to increase the diversity of the undergraduate and graduate student body. Moreover, all departments must accept responsibility for helping to increase mathematical literacy in American society. Indeed, the health of the nation is threatened by the fact that large groups of our population have traditionally remained, and continue to remain, unconversant with science, engineering, mathematics, and technology. Depending on the institutional and departmental missions, these responsibilities may also include research, mentoring of doctoral students, articulation between high school and college, outreach, service to the community and to the nation, involvement with K–12 education, and liaison with industry.

The optimal strategy for meeting these varied departmental responsibilities is not to expect all faculty members in the department to do all things at all times, but rather to match faculty work with faculty interests so that, to the extent possible, each faculty member accepting a departmental duty has an interest in that duty and will perform it well. For example, a faculty member who needs extra time for research may be freed from student advising because another faculty member prefers to focus on advising. This can result in a net gain for the department in both research productivity and quality of advising, as well as a higher level of satisfaction for both faculty members. But, in order to work, this approach must be accompanied by a rewards system that recognizes excellent contributions to all facets of the departmental mission. In order to recognize the shared responsibility for fulfilling the mission of the department, some rewards might productively be restructured as group or department rewards.

It should not be assumed that faculty members will throughout their careers continue to have the same interests and the same ways of contributing to their

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It should not be assumed that faculty members will throughout their careers continue to have the same interests and the same ways of contributing to their departments and profession.

departments and profession. Departmental planning should take account of these changing interests, and the rewards structure should be flexible enough to recognize that the kinds of contributions that a given faculty member makes may vary over time. At the same time, departments need to state clearly what they are about and must appropriately support the expectations that they lay out. This is especially important with junior, untenured faculty. For instance, to a considerable extent everyone should be involved in research or scholarship, allowing for (sometimes large) differences according to institutions, in the expected level of achievement. Departments wishing to have their members actively engaged in research certainly need to encourage and support their members in this activity, and under these conditions research would become a relatively large factor in hiring and tenure decisions.

We encourage regular consultations between chairs and individual faculty members about the needs of the department, the goals of the faculty members, and the best match between the two. Such consultations would provide one way to enhance communication and address the problems described in Finding V. These consultations should include discussion of the scholarly, teaching, and service interests of the faculty and should result in agreements on how faculty members will allocate their time and effort over the next year or two. The rewards system should then support these agreements.

In addition, we encourage the use of periodic reviews for all faculty members, tenured as well as untenured. Spaced at intervals of perhaps three to five years, these reviews are important for optimizing the effective use of the department's personnel and for identifying areas that need attention or that merit special recognition. Such reviews will also help address the problem of declining public confidence in higher education.

Finally, one of the most important functions of a department is the development of the talent of its junior faculty. Such mentoring could include helping these faculty members keep abreast of the current situation in the job market and how best to be successful in it, know how well they are progressing toward the goal of a permanent position, keep informed of the requirements for tenure if they have tenure-track positions, and begin a viable research and teaching career. We encourage departments to put into place a system in which mentoring is a well-defined responsibility of the senior faculty and one for which they are recognized and rewarded. Such a system would also help to ameliorate the communication problems described in Finding V as well as help to ensure the future well-being of the department.

Guiding Principle IV

All faculty members in colleges and universities should engage in scholarship throughout their careers and the institution and department should encourage, support, and reward this activity. Moreover, each department, together with the institution, should develop a working definition of scholarship that is consistent with the departmental and institutional missions and is sufficiently encompassing and flexible to embrace the broad variety of intellectual activities in the discipline.

Discussion

The mathematical sciences as a discipline is held together by the glue of research and scholarship. The fundamental role of research has been discussed in Guiding Principle I. The many and varied activities that come under the more general umbrella of scholarship are also of critical importance to the mathematical sciences. These activities include, but are not limited to, writing expository papers and textbooks, communicating mathematical developments to the general public, developing curricula, improving teaching methods, and research in mathematics education.

This kind of intellectual activity is crucial to teaching effectiveness. A teacher must be intellectually alive in a discipline to be able to communicate the subject effectively to students, regardless of the level of the teaching. Therefore, with appropriate modifications in the definition of scholarship, this Principle applies to all institutions of higher education.

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A proposal for a definition of scholarship appears in the Appendix of this report. Of course, a single definition of scholarship cannot be appropriate for every institution and department. Each department should interpret this definition according to its mission, the mission of its institution, and the needs of its constituents. Our purpose in presenting this definition of scholarship is to start a dialogue, not to dictate a definition for all institutions. In addition, the amount of scholarship expected from faculty members should be consistent with the amount of assigned teaching and other duties at the institution.

Every department has a sufficiently broad scope of responsibilities to allow a great deal of flexibility in its definition of scholarship. For example, the scholarly activities of a given individual should be allowed to vary over that individual's career. At the beginning of a career, especially at a research university, scholarship might consist principally of traditional research. But some senior faculty might be encouraged and rewarded in efforts to pursue other forms of scholarship.

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Guiding Principle V

Evaluation goes hand in hand with rewards. Departments should use the best available methods, imperfect though they may be, for evaluating teaching, research, scholarship, and service while also seeking to develop better methods of evaluation. Meanwhile, discomfort with current methods of evaluation is no reason not to reward the full range of professorial contributions.

Discussion

Every institution should work to develop efficient, robust, reliable, and trusted measures of teaching effectiveness. These could include peer evaluation, surveying of students from previous semesters (say, graduating seniors or alumni), studying student achievement in subsequent courses, reviewing syllabi and examinations, and other techniques. The perceived inability to evaluate teaching is one of the major stumbling blocks to making teaching an integral part of the rewards system in mathematical sciences departments. It is critical that this perception be changed. In addition, departments should develop evaluation mechanisms for such teaching-related activities as curriculum development, administering the teaching program, advising and mentoring students, and outreach to minorities and women.

The perceived inability to evaluate teaching is one of the major stumbling blocks to making teaching an integral part of the rewards system in mathematical sciences departments.

By far the most common (and often the only) method of evaluating teaching is the student evaluation form. Many faculty members feel that, when used as the sole measure of teaching effectiveness, student evaluations can be misleading and unreliable. The Committee agrees, but also believes that student evaluations, when collected over many semesters and over a number of courses, can identify important issues that faculty members and department chairs need to consider.

Methods should also be developed to evaluate scholarship that does not fit into the traditional mode of publishing in refereed journals. Much mathematical work that could be valuable is discouraged because it is not sufficiently rewarded. The important aspects of research are that it be shared with the community and that it be of high quality.

Service—whether to the department, the institution, the mathematical sciences community, or the nation—is often said to be the most difficult work to evaluate. However, because service is critical to departments, institutions, and the profession, appropriate mechanisms must be formulated to evaluate it. We note that the performance of the department chair is constantly evaluated formally from above and informally from below.

Departments also need to develop procedures for documenting and evaluating the overall performance and contributions of faculty members. This is not only needed to be

able to reward faculty members for their contributions, but also to provide useful feedback for the faculty. Usually, much more is known about the performance of the individuals in the department than is acknowledged. Each faculty member needs to know that contributions which further the departmental and institutional missions and are of sufficiently high quality will be valued and rewarded.

A common method of evaluating faculty is on the basis of receipt of grants from outside the university. These could be grants for either mathematical research or mathematics education projects. The "best" grants are often considered to be those with the largest overhead rate. We found tremendous unhappiness among faculty concerning excessive reliance on grant awards in the rewards system. As one faculty member put it, departments have switched from "publish or perish" to "get grants or go." There is clearly some validity to rewarding individuals whose work is judged to be of sufficiently high merit to warrant such funding. However, the amount of money available is so small that even excellent work is often not funded. Also, many of the contributions faculty members make are not "fundable". It is a serious mistake to let external funding control the rewards structure.

Departments should not allow imperfections in evaluation mechanisms to impede progress in broadening the rewards structure. After all, such problems have not hampered the use of traditional research published in refereed journals as a primary component of the rewards structure. One of the reasons research is singled out in this way is that most people feel comfortable evaluating it. The fact that outside evaluators (the editor and the referee) have given their blessing to a work by publishing it constitutes an objective criterion to which one can point. On the other hand, we found considerable suspicion in the community about the objectivity of this criterion. Moreover, for most faculty, an in-depth formal analysis of research quality is done only two or three times, at hiring and promotion. The annual research review is often much more cursory, perhaps only involving a listing of articles. Still, these imperfections in evaluating research have been no impediment to its important role in the rewards structure.

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National leadership on the issue of evaluation is needed. For example, a task force could be set up by the professional societies in the mathematical sciences to assess the evaluation systems currently being used and to create guidelines, models or suggestions for helping institutions improve their evaluation procedures. A compilation of the procedures that are already in use would also be a service. Other organizations in academia are examining such questions. For example, the American Association for Higher Education is studying the method of peer evaluation of teaching. Such studies should be examined for their applicability to mathematical sciences departments.

There have been many studies on the efficacy of student evaluations of teaching. We urge the professional societies to review this body of research as it relates to the teaching of mathematics. Also, there should be further research into various measures of teaching effectiveness, taking into account the special nature of mathematics teaching and the students, many of whom must take mathematics courses to fulfill university or major requirements. Such research would provide background for formulating guidelines, models, and recommendations for evaluating teaching.

Guiding Principle VI

Each department should ensure that its rewards structure is responsive to meeting the needs of the constituencies being served. An essential aspect of any well-functioning rewards structure is that all concerned—faculty, chair, and administration—know and understand what is valued and rewarded.

Discussion

No single rewards system will work for every mathematical sciences department in every kind of institution. Each department must develop a rewards system consonant with its own mission and the mission of the institution. In formulating a rewards structure, each department must analyze who its constituencies are, what they need from the department, and whether those needs are being met. The constituencies of a department are varied and many, and often not all of them are adequately taken into account in how the department organizes itself, designs and provides its services, and utilizes its resources. To varying degrees, depending on the institution, these constituencies include: undergraduate students and graduate students, both inside and outside the department; colleagues in other departments; mathematical colleagues; parents of students; local, state, and national government; taxpayers; the regional and national community; and business and industry. The point is that the rewards structure should be responsive to meeting the needs of these constituencies.

At the same time, the nature of academia is such that not everyone fits into the same mold, and this must be acknowledged and understood. Therefore, rather than codifying every aspect of a rewards system, departments should formulate clear and flexible policies.

The department chair is the leader in the implementation of any rewards system. Care in the selection and training of the chair is an important factor in the health and well-being of the department. Too little attention is paid to this important role. Every department should carefully select, and then support, a chair who understands the issues facing the department and who can deal with the multiple agendas in the institution. The mathematical sciences community can help by organizing more workshops for chairs and other training and development mechanisms.

Each department must develop a rewards system consonant with its own mission and the mission of the institution. In formulating a rewards structure, each department must analyze who its constituencies are, what they need from the department, and whether those needs are being met.

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Concluding Remarks

We urge that departments move forward on the recommendation and agenda presented in this report. We also urge the professional societies to move forward on studies of some of the specific issues raised in this report. Above all, we urge that the mathematical sciences community continue, and indeed expand, the dialogue that has already begun on these important issues. It is only from thoughtful, considered discussion and debate that lasting change will emerge.

APPENDIX

Defining Mathematical Scholarship

College and university faculty members are scholars as well as teachers. They must stay abreast of the latest developments in their fields in order to remain effective as teachers. Society looks to academia to advance the frontiers of knowledge and to communicate those advances not only to their students but also to the larger public. Colleges and universities provide a particularly supportive environment for free inquiry, discovery, and the incubation of ideas. Academic scholars provide an important resource that can be drawn upon to address pressing local, regional, and national needs.

But what is scholarship? For some, scholarship is defined narrowly as research leading to new knowledge that is publishable in the leading research journals. Others define scholarship broadly as any activity that leads to increased knowledge or understanding on the part of the individual scholar. Between these two extremes is a variety of activities that may or may not be recognized as scholarly by those who make judgements about scholarship: deans, department chairs, colleagues and students, journal editors, and the public.

Each mathematical sciences department should formulate an explicit and public definition of scholarship that will inform its faculty members on the kinds of scholarly activity that are valued by the department, guide administrators and review committees that are charged with evaluating and rewarding that scholarship, and help all interested parties to understand the scholarly component of the departmental mission. This definition should, of course, be consistent with the mission of the institution. It should embrace the variety of scholarly activities in all fields that the institution and the department wish to encourage and support.

Following is a draft definition of scholarship for the mathematical sciences that may serve as a guide to departments seeking to formulate their own definitions. This draft will, of course, need to be modified by each department to reflect its own values and mission and to conform to the institutional mission.

Scholarship in the mathematical sciences includes:

- research in core or applied areas that leads to new concepts, insights, discoveries, structures, theorems, or conjectures;
- research that leads to the development of new mathematical techniques, or new applications of known techniques, for addressing problems in other fields including the sciences, the social sciences, medicine, and engineering;
- research in teaching and learning that leads to new insights into how mathematical knowledge and skills are most effectively taught and learned at all levels;
- synthesis, or integration, of existing scholarship, such as surveys, book reviews, and lists of open problems;
- exposition that communicates mathematics to new audiences, or to established

audiences with improved clarity, either orally or in writing, including technical communications to scientists, engineers, and other mathematicians, as well as books, articles, multimedia materials, and presentations for teachers, government leaders, and the general public;

- development of courses, curricula, or instructional materials for teaching mathematics in K–12 as well as at the college level; and
- development of software that provides new or improved tools for supporting research in mathematics or its applications, for communicating mathematics, or for teaching and learning mathematics.

Good scholarship, in whatever form it takes, must be shared in order to have value. It must benefit more than just the scholar. The results of scholarly activities must be public and must be amenable to evaluation. Techniques appropriate for the evaluation of scholarship in the mathematical sciences include peer review and invitations to present results to others; awards and other forms of recognition; and impact measures, such as citations, evidence of the use of the scholarship in the work of others, evidence of improved effectiveness of a technique or activity as a result of the scholarly contribution, or evidence of improved understanding of mathematics on the part of some consumer group as a result of the scholarly activity.

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SUPPLEMENTARY DATA REPORT

SURVEY OF PROFESSIONAL RECOGNITION AND REWARDS IN THE MATHEMATICAL SCIENCES

SECTION A. Survey Methodology

SECTION B. Selected Data

SECTION C. Survey Questionnaires

This supplement describes the methodology used, and presents data produced by, a survey conducted by the Joint Policy Board for Mathematics Committee on Professional Recognition and Rewards during 1992 as part of its study of the recognition and rewards system in the mathematical sciences. The Committee's report and this supplement were published by the American Mathematical Society, Providence, Rhode Island, in May 1994. This material is based upon work supported by the National Science Foundation under Grants SED-9252716 and RED-9255720, and by a grant from the Exxon Education Foundation.

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SECTION A.
SURVEY METHODOLOGY

This mail survey of mathematicians in academic employment was conducted in October 1992 by American Mathematical Society (AMS) staff at the request of the JPBM Committee on Professional Recognition and Rewards, and under the supervision of the Survey's consultant, the Associate Director of the University of Maryland's Survey Research Center.

Two independent samples were selected for each type of institution (survey group): a) chairs and b) faculty members of departments of mathematical sciences at U.S. institutions. "Mathematical sciences departments" includes departments teaching mathematics, applied mathematics, and statistics; however, separate departments of statistics were not surveyed.

1. Chairs

The chairs' sample was drawn from the AMS database of chairs of departments of mathematical sciences at four-year and two-year institutions in the United States. Departments are included in this database if they offer courses in mathematics creditable towards a bachelor's degree. The sample was selected in fall 1992 after completion of the annual update of the database during the summer of 1992. Institutions were classified according to the highest degree granted by the mathematical sciences department, following the classification developed for the Annual AMS-MAA Surveys. In this classification doctorate-granting departments are further divided into subgroups, based on ranking in a 1982 assessment of research-doctorate programs conducted by the Conference Board of Associated Research Councils.

All chairs of doctorate-granting departments were surveyed; chairs of master's and bachelor's degree-granting departments, and two-year programs, were sampled. Sample sizes and total populations at the time of sample selection follow.

Survey Group	Population		Sample size
PhD-1	39	top-ranked doctorate-granting departments of mathematics	39
PhD-2	43	next-ranked doctorate-granting departments of mathematics	43
PhD-3	86	unranked doctorate-granting departments of mathematics	86
PhD-5	14*	doctorate-granting departments of applied mathematics	14
MA	243	master's degree-granting departments of mathematical sciences	150
BA	964	bachelor's degree-granting departments of mathematical sciences	149**
2YR	900	two-year programs in mathematical sciences at community and junior colleges	150

* Adjusted. Doctorate-granting programs in applied mathematics who reported that their faculty members were drawn from the department of mathematics were excluded.

** Adjusted. One institution had closed.

2. Faculty

Faculty samples for the above groups (except for 2-year faculty) were selected from the AMS database of members of three mathematical societies: the American Mathematical Society (AMS), The Mathematical Association of America (MAA), and the Society for Industrial and Applied Mathematics (SIAM). The population from which the samples were drawn was identified as those members of any one of the three societies who a) held faculty positions at U.S. academic institutions, and b) were in departments of mathematical sciences (i.e., computer science, computer centers, engineering departments, and libraries were selected out), and c) were not classified as students, instructors, teaching assistants, nominee or reciprocal members, retired or part-time. The total of 21,380 members who met these criteria were then coded by the group classification of the department of mathematics at their institution, listed above. Within each group, samples were selected with equal probabilities, using a systematic sample. However, selection probabilities varied between groups, so weights were required for combined group analysis. Since the primary goal of the survey was to do separate group analysis, approximately equal numbers of cases were desired in each group to give equal reliability for each one. The sample size was selected to achieve 150-200 responses in each group, taking into account anticipated survey eligibility and mail return rates. Sample sizes and total populations at the time of selection follow.

Survey Group	Population*	Sample size**
PhD-1	3021	224***
PhD-2	2307	188***
PhD-3	2870	373
MA	5049	375
BA	7311	305

* A comparison was done of the total identified faculty populations in the AMS database with estimates of total full-time faculty produced by the 1990-91 CBMS Survey **[1]** and the 1991 Annual AMS-MAA Survey **[2]**.

** Adjusted for unwanted ranks, based upon responses to question about rank/title.

*** PhD-1 and PhD-2 were originally combined into one group by the Committee, but were later reported separately.

Faculty in PhD-5 (separate doctorate-granting applied mathematics departments) were in the surveyed population, but, because inconsistency of department titles created identification problems, they were coded by the group code of the mathematics department at that institution and fell primarily in the PhD-1 classification.

2-Yr Faculty

Faculty at two-year institutions were surveyed using a sample of 300 of the members of the American Mathematical Association of Two-year Colleges (AMATYC). The total membership at the time of the sample (summer of 1992) was 2,652. Academic affiliation was known for almost one third of the sample and, after discarding retired members and those in nonacademic employment, 291 of the 300 were surveyed.

3. Survey Questionnaires

Two questionnaires for chairs and faculty were designed by the Committee in spring/summer of 1992, in consultation with the Survey Consultant, members of the AMS-MAA Data Committee, and AMS Survey staff. Extensive Committee discussions and contacts with selected reviewers were part of the questionnaire development. The questionnaires were designed with a considerable amount of overlap of questions between the two populations, to allow for comparison of responses. Several questions listed 17 activities of mathematics faculty (to learn to what extent they were factors in evaluations, promotions, salary increases, etc.) and the questionnaire length was therefore driven by these questions. A pretest of 18 department chairs and 19 faculty members in all survey groups was conducted in August 1992, after which some modifications to survey questions were made.

The questionnaires were mailed to 632 department chairs and 1,950 faculty members on October 15 1992, with a cover letter signed by the Presidents of the three JPBM societies (AMS, MAA and SIAM); in the case of two-year chairs and faculty an additional cover letter from the President of AMATYC was also enclosed. Copies of the two questionnaires can be found in Section C.

Telephone followup for nonresponses began a few weeks after mailing and continued until a satisfactory response rate had been achieved (for all groups except two-year faculty), in March 1993. The mathematical community had been alerted to the survey at national and sectional meetings of the three societies, and in society news publications.

4. Response Rates

Apart from two-year faculty, response rates were fairly uniform across the survey groups.

	Sample	Respondents	Response Rate
CHAIRS			
PhD-1	39	32	82%
PhD-2	43	39	91%
PhD-3	86	64	74%
PhD-5	14	11	79%
MA	150	104	69%
BA	149	112	75%
2YR	150	114	76%
FACULTY			
PhD-1	224	128	57%
PhD-2	188	111	59%
PhD-3	373	237	64%
MA	375	219	58%
BA	305	199	65%
2YR	291	114	39%

Respondents and non-respondents determined during data collection (or through department contacts) to be ineligible for the survey (based on the criteria discussed earlier) were removed from the sample base.

5. Data Analysis

A preliminary analysis of data received by December 28, 1992 was done by AMS staff for the Committee's review at their January 1993 meeting.

The final set was analyzed by a data analyst at the University of Maryland, under the direction of the Survey Consultant. An additional consultant (from the Department of Statistics, University of California, Berkeley) was retained to assist the Committee's review of the data analyses. A subgroup of the Committee reviewed the analyses in April, after which further analyses of the nonrespondents were run to detect any differences in age, gender, and rank that might bias the responding group. In addition, the subset of responses received after followup intensified was compared with preliminary analyses.

The Committee subgroup decided not to report data for PhD-5 chairs (applied mathematics department) because of concerns about maintaining confidentiality due to the very small sample size. It was also decided not to report data for two-year respondents because of the low response rate from faculty in this group (despite intensive followup efforts and assistance from AMATYC officers).

After further analyses of the data and of the nonrespondents, the subgroup met again in June to review survey results. A report highlighting the significant data was presented to the full Committee in July. Those data now appear in this supplement to the Committee's final report, "Recognition and Rewards in the Mathematical Sciences", which was published by the AMS in May 1994.

REFERENCES:

[1] Albers, Donald J. et al. Statistical Abstract of Undergraduate Programs in the Mathematical Sciences and Computer Science in the United States: 1990-91 CBMS Survey. MAA Notes 23. Washington, DC: Mathematical Association of America, 1992.

[2] McClure, Donald E. Enrollments, Faculty Characteristics, and Update on New Doctorates, Fall 1991. 1991 Annual AMS-MAA Survey, Second Report. NOTICES OF THE AMS, May/June 1992.

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SECTION B. SURVEY DATA

The JPBM Committee on Professional Recognition and Rewards, working with subcommittees and consultants, reviewed the extensive data produced by this survey and determined the following data were the most significant and meaningful for the Committee's work.

The Committee found it helpful to group data by topic. Many tables contain data from several survey questions, which are referenced in the table title. Readers should refer to the survey questionnaires in Section C for the specific text of the questions.

Requests for additional data should be sent to Monica Foulkes, American Mathematical Society, 1527 Eighteenth Street NW, Washington DC, 20036 (tel: 202-588-1100, e-mail: mxf@math.ams.org). Please note that data that could identify the responses of particular individuals will not be released.

Data on RESEARCH IN THE DISCIPLINE

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 1. Importance of research in the discipline (from questions F3,9,13,14 and C2,8,12,13)

Vi+Si = Very important + Somewhat important (combined) Vi = Very important (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
For salary (ACTUAL)	100	97	100	100	96	89	100	100	99	88	100	93	89	82	87	65	68	32	77	32
For salary (SHOULD)	100	91	100	97	98	86	100	95	99	86	100	97	97	67	94	62	85	41	75	33
For promotion (ACTUAL)	100	98	100	100	99	96	100	95	98	91	100	100	93	71	95	65	76	38	76	29
For promotion (SHOULD)	100	95	100	100	98	88	100	97	99	87	100	98	93	67	94	64	83	35	86	29

TABLE 2. Change over last 5 years (from questions F4,15 and C3,14)

"More-less" = percent difference between those who felt research is valued more now, and those who felt it is valued less.

For salary (more-less)	-5	-7	2	-3	19	19	49	43	55	39
For salary (no change)	78	85	65	75	53	78	35	40	35	58
For promotion (more-less)	9	3	13	8	31	37	52	54	63	43
For promotion (no change)	79	97	62	72	50	60	36	34	27	46

TABLE 3. Differences in performance reflected in salary (from questions F6 and C5)

YES	96	100	80	100	79	98	61	87	*60	*62

TABLE 4. Incentives for research (from questions F22 and C23)

MaMo = Major incentive + Moderate incentive (combined) Ma = Major incentive (only)

	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma
Reduced teaching loads	49	26	68	46	48	16	63	34	62	22	72	47	61	26	82	48	46	27	42	15
Make contributions to fld	100	87	100	88	95	69	100	90	97	66	98	78	85	57	87	39	76	47	68	22
Personal satisfaction	100	95	100	97	99	88	100	95	100	89	98	87	99	88	95	68	94	78	91	62
Peer recognition	88	50	100	97	88	43	97	97	83	41	95	73	77	34	89	39	70	26	81	28
Institutional expectations	65	23	88	63	70	28	90	67	74	27	97	57	59	14	85	38	51	13	56	15
Summer support	64	30	97	67	56	27	76	54	52	28	67	33	37	21	53	13	38	14	38	8
Promotion and tenure	55	38	100	100	70	45	100	95	75	52	100	92	71	38	96	78	72	32	79	44
Salary increases	70	32	94	71	72	42	92	79	76	37	94	81	58	28	85	53	58	22	57	23
Other instnl. rewards	51	24	60	17	63	17	68	28	63	25	76	31	50	16	73	19	55	17	48	11

Data on RESEARCH IN DISCIPLINE - continued

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 5. Importance in evaluating research (from questions F24 and C25)

Vi + Si = Very important + Somewhat important (combined) Vi = Very important (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
Non-refereed publications	39	5	40	8	32	3	32	0	30	3	22	0	46	4	36	6	*51	12	*63	2
Refereed publications	98	92	100	88	99	97	100	95	100	94	100	100	99	92	99	95	100	89	95	80
Citations	41	15	21	6	42	9	44	11	37	8	42	3	43	12	41	11	34	5	41	17
Grants, contracts etc	93	61	73	23	99	75	97	76	94	72	98	62	92	51	90	48	86	44	85	51
Conf presentations	79	28	58	19	82	18	82	32	80	15	92	17	86	23	92	25	92	30	90	39

TABLE 6. Evaluation of single-authored papers/co-authored papers (from question F25 and C26)

MuMo = Much more + More (combined) Mu = Much more (only)

	MuMo	Mu	MuMo	Mu	MuMo	Mu	MuMo	Mu	MuMo	Mu	MuMo	Mu	MuMo	Mu	MuMo	Mu	MuMo	Mu	MuMo	Mu
	58	6	38	0	57	3	51	3	58	8	39	3	52	9	51	2	*50	10	*44	3

TABLE 7. Are faculty currently doing research? (Faculty only) (from question F21)

YES	91		92		89		68		58	

TABLE 8. Is research evaluated in dept? (from questions F23 and C24)

YES	86	84	92	97	90	95	68	80	45	37

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Data on TEACHING

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 9. Importance of teaching (from questions F3,9,13,14 and C2,8,12,13)

Vi+Si = Very important + Somewhat important (combined) Vi = Very important (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
For salary (ACTUAL)	50	8	68	29	56	14	94	51	60	24	93	53	80	50	97	74	89	62	97	83
For salary (SHOULD)	93	36	97	48	94	51	100	76	98	63	100	75	98	78	100	92	99	92	100	98
For promotion (ACTUAL)	65	11	79	25	72	19	95	47	66	26	90	39	86	52	94	75	95	77	96	91
For promotion (SHOULD)	97	35	89	32	92	57	100	78	97	67	100	81	99	84	100	94	99	93	100	99

TABLE 10. Change over last 5 years (from questions F4,15 and C3,14)

"More-less" = percent difference between those who felt teaching is valued more now, and those who felt it is valued less.

For salary (more-less)	36	52	26	54	19	41	-17	-7	-25	9
For salary (no change)	50	41	46	46	52	49	49	50	60	74
For promotion (more-less)	33	63	29	49	14	29	-13	2	-11	2
For promotion (no change)	52	37	41	51	48	49	51	53	59	63

TABLE 11. Differences in performance reflected in salary? (from questions F6 and C5)

YES	28	54	34	71	30	73	39	75	*51	*85

TABLE 12. Incentives for good teaching (from questions F17 and C19)

MaMo = Major incentive + Moderate incentive (combined) Ma = Major incentive (only)

	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma
Help students learn	98	85	97	62	99	86	97	65	99	85	94	67	98	88	100	74	100	93	100	88
Improve curriculum	76	27	65	19	74	25	83	20	69	25	69	18	80	36	80	21	89	40	91	28
Personal satisfaction	95	73	97	86	95	75	97	73	95	77	98	73	97	83	96	74	97	83	99	74
Student recognition	58	18	57	14	63	13	61	17	61	13	55	11	65	23	66	17	76	26	76	19
Peer recognition	36	6	46	7	53	11	58	17	51	6	55	8	58	13	68	16	72	14	70	18
Institutional expectations	45	11	68	11	54	12	75	22	47	8	76	19	52	9	72	33	62	15	84	40
Promotion and tenure	30	8	64	18	42	15	89	28	51	17	89	42	53	19	94	53	64	21	85	54
Salary increases	22	6	48	11	38	10	67	31	48	12	61	20	48	18	69	32	54	22	62	24
Other instnl. rewards	12	6	16	0	27	4	14	11	31	9	19	5	32	10	29	4	44	12	33	4

Data on TEACHING - continued

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 13. Importance for rewards (from questions F18 and C20)

Vi + Si = Very important + Somewhat important (combined) Vi = Very important (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
Lower division teaching	39	7	76	14	43	9	80	31	47	14	69	26	62	27	86	51	77	52	78	58
Upper division teaching	44	5	76	17	56	10	89	37	62	14	87	30	77	32	94	53	85	51	87	54
Graduate teaching	71	13	93	27	71	19	97	47	78	24	90	38	74	31	82	30	*53	19	*61	23

TABLE 14. Is teaching evaluated in dept? (from questions F19 and C21)

YES	92		91		99		100		97		100		96		99		94		97	

TABLE 15. Importance of methods of evaluation (from questions F20 and C22)

Vi + Si = Very important + Somewhat important (combined) Vi = Very important (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
Student evaluations	95	60	97	59	95	78	100	74	96	66	98	73	98	71	97	76	96	73	96	74
Observation by peers	46	15	61	25	40	10	61	11	34	10	50	15	46	22	56	34	64	28	66	29
Informal evaluatn by peers	50	13	61	4	45	12	68	16	48	11	62	13	46	10	61	15	67	24	70	25
Past students/alum eval	18	8	11	4	31	10	43	19	22	4	33	7	27	5	29	5	36	9	36	7
Self-evaluation	11	4	28	8	6	1	24	5	14	4	20	3	33	9	46	11	46	16	67	28
Achievemt of former stdnts	22	4	35	12	14	1	38	11	20	2	31	3	22	2	37	5	26	2	31	1
Classroom materials	10	1	7	0	8	2	30	5	13	1	24	2	24	4	41	7	35	4	38	5
Grading practices	15	4	25	0	22	3	35	5	19	1	31	0	25	2	41	3	31	4	31	1
Work w/students(outside)	35	4	68	7	36	5	68	14	35	4	71	9	54	11	87	30	69	21	86	30

Data on SERVICE

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.
* Denotes a cell with a response rate less than half of the overall response rate given in Section A.
All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 16. Importance of service (from questions F3,9,13,14 and C2,8,12,13)

Vi+Si = Very important + Somewhat important (combined) Vi = Very important (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
A. Service to institution																				
For salary (ACTUAL)	48	3	61	7	39	2	62	8	40	4	63	7	57	16	74	19	79	28	86	33
For salary (SHOULD)	72	13	90	17	75	8	79	11	65	8	78	15	74	23	81	23	82	29	90	38
For promotion (ACTUAL)	32	3	21	4	22	0	45	9	33	6	26	5	67	18	65	25	78	29	86	40
For promotion (SHOULD)	48	8	42	4	56	7	76	14	57	8	59	8	75	21	83	25	84	29	91	38
B. Service to profession																				
For salary (ACTUAL)	32	3	41	0	23	2	46	5	28	3	51	0	42	6	64	4	51	4	56	8
For salary (SHOULD)	61	7	71	4	58	5	71	13	64	7	70	5	65	12	78	11	64	13	74	12
For promotion (ACTUAL)	21	1	22	0	22	0	39	3	21	3	23	2	47	4	47	11	46	7	55	9
For promotion (SHOULD)	39	6	32	0	42	4	62	14	48	5	47	2	59	13	70	12	65	12	69	10
C. Service to community																				
For salary (ACTUAL)	16	1	31	0	14	1	34	3	25	2	31	0	45	7	67	11	43	5	52	5
For salary (SHOULD)	48	7	62	4	49	9	61	16	58	9	68	7	70	19	79	21	71	13	73	14
For promotion (ACTUAL)	7	1	25	0	11	1	25	6	18	3	18	0	44	4	45	10	42	4	55	10
For promotion (SHOULD)	29	5	33	4	31	4	51	11	42	4	44	5	61	15	74	23	65	11	68	14

TABLE 17. Change over last 5 years (from questions F4,15 and C3,14)

"More-less" = percent difference between those who felt service is valued more now, and those who felt it is valued less.

For salary (more-less)	1	26	-1	11	-6	-7	-13	-14	-6	-7
For salary (no change)	87	74	78	78	76	76	69	52	72	76
For promotion (more-less)	0	3	-10	3	-9	-10	-9	-17	-12	2
For promotion (no change)	88	84	78	82	75	81	70	58	66	69

TABLE 18. Differences in performance reflected in salary? (from questions F6 and C5)

YES	30	46	34	58	29	52	41	61	*48	*61

Data on SERVICE - continued

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 19. Incentives for service (from questions F27 and C27)

MaMo = Major incentive + Moderate incentive (combined) Ma = Major incentive (only)

	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma	MaMo	Ma
Personal satisfaction	78	43	97	47	84	47	92	66	79	46	86	52	81	53	91	52	82	57	89	51
Peer recognition	37	13	55	14	49	11	58	24	47	10	60	13	48	8	64	8	58	15	63	11
Institutional expectations	54	25	63	17	44	10	69	23	54	18	67	14	60	16	67	20	74	28	75	36
Summer support	6	1	20	4	20	4	26	11	22	6	16	7	19	9	18	4	19	3	23	5
Promotion and tenure	15	1	31	7	22	3	46	14	29	10	45	8	47	16	76	36	58	25	83	32
Salary increases	21	5	36	11	25	4	46	11	34	8	46	2	41	11	59	28	47	17	56	17
Other instnl. rewards	9	1	17	4	21	2	20	7	30	8	14	2	28	5	30	5	34	7	35	8

TABLE 20. Is service evaluated in dept. (from questions F28 and C28)

YES	33	32	43	59	52	53	50	58	48	43

TABLE 21. Is quality of service evaluated by recipients (Chairs only) (from question C29).

YES		40		29		27		55		*53

TABLE 22. Do faculty participate in service? (Faculty only) (from question F26).

YES		88		94		90		80		89

Data on INTERDISCIPLINARY RESEARCH and APPLICATIONS

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 23. Importance in rewards system (from questions F3,9,13,14 and C2,8,12,13)

Vi + Si = Very important + Somewhat important (combined) Vi = Very important (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
A. Interdisciplinary research involving new mathematics																				
For salary (ACTUAL)	73	28	88	60	73	36	94	57	75	31	88	55	65	31	71	31	50	12	55	14
For salary (SHOULD)	88	51	89	54	92	58	97	67	90	49	95	68	85	44	87	40	75	25	76	24
For promotion (ACTUAL)	71	29	88	58	71	34	89	49	73	29	89	61	70	29	72	24	54	14	63	16
For promotion (SHOULD)	89	44	92	65	88	49	94	56	87	42	92	71	81	37	82	37	74	18	80	18
B. Applications of existing mathematics to other fields																				
For salary (ACTUAL)	56	14	73	36	50	11	76	35	61	15	78	28	52	17	69	21	51	7	63	10
For salary (SHOULD)	77	25	82	32	83	35	81	44	79	32	92	38	83	33	86	29	76	23	79	22
For promotion (ACTUAL)	53	17	80	40	53	18	69	31	60	14	73	29	63	21	72	14	51	9	64	11
For promotion (SHOULD)	76	27	84	44	77	27	81	33	78	28	84	33	80	29	80	26	70	16	86	18

Data on SCHOLARSHIP

A. Research on educational issues.
B. Presenting papers at conferences.
C. Presenting colloquiums and seminars.
D. Expository writing.

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

TABLE 24. Importance in rewards system (from questions F3,9,13,14 and C2,8,12,13)

Vi+Si = Very important + Somewhat important (combined) Vi = Very important (only)

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
A. Research on educational issues																				
For salary (ACTUAL)	14	4	22	9	19	3	53	13	36	6	52	11	52	12	65	13	47	9	49	5
For salary (SHOULD)	47	10	54	15	51	9	74	31	61	21	81	25	70	22	78	21	69	17	80	18
For promotion (ACTUAL)	12	3	13	0	10	2	34	17	30	7	43	11	53	12	64	10	51	5	56	7
For promotion (SHOULD)	33	9	40	8	35	3	59	15	55	16	61	23	64	19	79	27	65	13	78	12
B. Presenting papers at conferences.																				
For salary (ACTUAL)	67	17	61	7	67	12	67	14	70	13	82	16	73	27	83	29	74	16	78	24
For salary (SHOULD)	64	14	53	13	69	17	71	21	71	17	85	13	82	20	84	26	81	18	78	20
For promotion (ACTUAL)	64	19	64	11	70	17	71	21	70	21	76	19	78	26	90	21	73	16	81	25
For promotion (SHOULD)	61	13	59	7	75	14	65	22	75	17	86	19	81	23	87	31	79	18	81	22
C. Presenting colloquiums and seminars																				
For salary (ACTUAL)	62	12	57	4	54	11	61	11	54	8	64	8	67	11	71	18	64	7	76	17
For salary (SHOULD)	64	13	56	11	73	14	71	21	68	14	73	12	83	17	82	16	84	15	78	17
For promotion (ACTUAL)	60	15	56	11	64	13	68	11	58	12	57	13	70	17	72	13	67	8	76	21
For promotion (SHOULD)	60	12	56	7	71	13	68	14	69	13	76	14	78	19	82	24	77	13	81	20
D. Expository writing																				
For salary (ACTUAL)	27	2	11	0	26	2	38	11	37	6	43	0	49	9	58	6	45	7	48	5
For salary (SHOULD)	55	9	59	11	73	9	57	19	65	16	65	8	70	15	74	17	62	11	58	15
For promotion (ACTUAL)	23	3	11	0	20	1	32	8	25	3	29	2	54	11	58	4	43	2	48	6
For promotion (SHOULD)	42	9	33	4	47	3	58	22	57	9	48	6	67	18	77	14	63	8	59	16

Data on OTHER EDUCATIONAL ACTIVITIES

A. Student advising.

B. Doctoral thesis supervision

C. Master's and bachelor's thesis supervision

D. Curriculum development.

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

TABLE 25. Importance in rewards system (from questions F3,9,13,14 and C2,8,12,13)

Vi + Si = Very important + Somewhat important (combined) Vi = Very important (only)

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
A. Student advising.																				
For salary (ACTUAL)	20	3	11	4	9	2	24	8	23	4	37	2	33	8	60	16	48	16	50	8
For salary (SHOULD)	53	9	62	7	43	13	68	11	56	11	78	10	63	17	78	22	75	27	82	32
For promotion (ACTUAL)	10	2	19	0	8	2	26	3	18	3	20	2	31	8	45	12	49	16	66	17
For promotion (SHOULD)	47	8	37	4	35	11	56	19	54	9	60	7	63	18	80	17	75	24	85	33
B. Doctoral thesis supervision																				
For salary (ACTUAL)	82	25	96	25	72	17	97	51	74	25	87	40	Not				Not			
For salary (SHOULD)	98	48	100	66	98	45	97	63	95	44	98	63	Applicable				Applicable			
For promotion (ACTUAL)	65	16	78	30	62	10	86	35	69	20	69	25								
For promotion (SHOULD)	86	31	89	33	85	37	86	57	86	35	84	38								
C. Master's and bachelor's thesis supervision																				
For salary (ACTUAL)	23	1	33	0	22	1	43	3	48	7	59	11	53	10	77	13	*41	6	*50	14
For salary (SHOULD)	55	3	68	26	61	12	69	9	77	17	72	22	79	22	89	20	*75	17	*88	19
For promotion (ACTUAL)	19	2	27	0	13	2	31	6	41	6	42	4	51	10	62	9	*45	7	*44	8
For promotion (SHOULD)	40	3	50	7	45	10	63	9	69	13	63	14	78	21	91	14	*73	17	*64	12
D. Curriculum development.																				
For salary (ACTUAL)	37	4	46	4	27	4	51	3	36	3	57	7	51	7	76	17	69	12	67	19
For salary (SHOULD)	68	15	72	21	72	16	81	11	75	19	87	28	80	24	89	34	88	30	92	32
For promotion (ACTUAL)	20	3	21	8	12	2	37	0	25	2	23	3	53	9	66	9	61	10	70	13
For promotion (SHOULD)	52	5	38	13	48	12	70	11	64	14	73	15	80	25	90	27	85	25	91	34

Data on OTHER FACTORS

A. Competing offers from other institutions.

B. Receipt of extramural grants and contracts

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

TABLE 26. Importance in rewards system (from questions F3,9,13,14 and C2,8,12,13)

Vi+Si=Very important + Somewhat important (combined) Vi=Very important (only)

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
A. Competing offers from other institutions.																				
For salary (ACTUAL)	92	75	96	86	79	54	82	47	67	32	58	33	31	9	26	9	28	12	*16	4
For salary (SHOULD)	70	21	86	59	58	16	69	31	43	10	45	21	26	9	30	4	28	4	*13	0
For promotion (ACTUAL)	87	62	93	70	75	43	77	29	56	20	37	19	28	7	24	5	25	0	*16	0
For promotion (SHOULD)	62	25	82	46	51	15	64	25	42	9	28	12	21	6	18	2	24	2	*14	1
B. Receipt of extramural grants and contracts																				
For salary (ACTUAL)	87	53	79	25	98	67	100	62	92	71	97	65	76	36	91	44	69	31	75	23
For salary (SHOULD)	73	21	55	17	77	30	92	55	83	29	86	42	71	21	88	38	61	10	66	13
For promotion (ACTUAL)	88	55	86	29	98	65	92	61	92	60	97	65	79	40	89	46	68	21	65	20
For promotion (SHOULD)	70	19	64	14	72	31	92	51	80	28	95	37	67	21	82	32	61	9	62	11

GENERAL

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 27. Relative weights given to research/teaching/service for changing interests (from questions F4,10 and C4,9)

YES (CAN change)	71	88	65	81	65	86	72	79	65	74
YES (SHOULD change)	90	93	80	92	90	93	88	95	93	89

TABLE 28. Satisfaction with feedback about salary evaluations (from questions F7 and C6)

Vs + Ss = Very satisfied + Somewhat satisfied (combined) Vs = Very satisfied (only)

Vs+S	Vs	Vs+S	Vs	Vs+S	Vs	Vs+S	Vs	Vs+S	Vs	Vs+S	Vs	Vs+S	Vs	Vs+S	Vs	Vs+S	Vs	Vs+S	Vs
56	18	68	8	53	11	83	20	54	16	84	18	64	18	81	15	57	22	49	11

TABLE 29. Preferred method for salary increases (from questions F8 and C7)

Across-the-board	2	0	5	3	3	3	18	18	23	16
Merit based only	17	13	10	26	10	15	7	9	5	7
Combination	81	87	84	72	87	82	75	74	72	77

TABLE 30. Importance of outside assessments for promotion and tenure (from questions F16 and C15)

Vi + Si = Very important + Somewhat important (combined) Vi = Very important (only)

Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
99	91	100	100	97	86	97	92	90	65	97	88	52	25	58	33	38	9	31	7

TABLE 31. Fairness of institutional support to department (from questions F29 and C30)

Vf + Sf = Very fair + Somewhat fair (combined) Vf = Very fair (only)

Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf	Vf+Sf	Vf
58	15	62	7	45	10	49	11	50	11	52	8	60	15	70	13	73	23	80	20

GENERAL - continued

As some tables present data from one or more survey questions, please refer to the survey questionnaires in Section C for the full text of each question. "Fn" refers to the faculty survey questionnaire number; "Cn" to the chairs questionnaire.

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1				PhD-2				PhD-3				Masters				Bachelors			
	Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs		Faculty		Chairs	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%

TABLE 32. Influence of various bodies on decisions (Chairs only) (from question C16)

Vi+Si = Very influential + Somewhat influential (combined) Vi = Very influential (only)

	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi	Vi+Si	Vi
A. Decisions about hiring																				
Dept Committee			97	88			97	79			95	75			94	70			80	20
Dept Chair			84	10			92	23			98	27			95	31			86	28
Faculty Committee (outside)			4	4			3	3			2	0			1	0			13	6
Outside Administrators			13	0			14	14			7	5			12	6			28	11
B. Decisions about tenure & promotions																				
Dept Committee			97	91			95	79			79	71			61	33			44	26
Dept Chair			71	10			69	15			81	20			70	29			51	14
Faculty Committee (outside)			36	7			34	17			32	12			42	23			63	35
Outside Administrators			20	0			19	11			41	13			45	23			58	33
C. Decisions about salaries																				
Dept Committee			69	50			53	28			45	13			28	7			14	5
Dept Chair			93	57			85	49			95	70			79	54			60	17
Faculty Committee (outside)			5	5			10	7			7	0			12	1			31	6
Outside Administrators			48	10			54	30			59	25			79	42			90	74

TABLE 33. Percent of Dept's recommendations for merit salary approved (Chairs only) (from question C17) -- MEAN

	95	92	92	89	74

TABLE 34. Percent of Dept's recommendations for promotion and tenure approved (Chairs only) (from question C18) -- MEAN

	91	88	88	79	83

TABLE 35. Percent of salary increase money awarded for merit (Chairs only) (from question C1a) -- MEAN

	57	59	59	35	21

TABLE 36. Percent of faculty reporting merit salary increases awarded (Faculty only) (from question F2)

YES	96	96	91	68	58

GENERAL - continued

* Denotes a cell with a response rate less than half of the overall response rate given in Section A.

All numbers are percentages.

	PhD-1		PhD-2		PhD-3		Masters		Bachelors	
	Faculty	Chairs	Faculty	Chairs	Faculty	Chairs	Faculty	Chairs	Faculty	Chairs
	% %	% %	% %	% %	% %	% %	% %	% %	% %	% %
TABLE 37. What approximate distribution of your time do you think would be in the best interests of the institution? (Faculty of the institution? (Faculty only) (from question F31)										
Graduate teaching	22		20		20		14		3	
Undergraduate teaching	23		29		32		48		65	
Research	41		37		36		24		18	
Service	14		14		12		14		14	
TABLE 38. During a typical academic year, what approximate percentage of your time is spent doing ... (Faculty only) (from question F30)										
Graduate teaching	21		19		16		11		2	
Undergraduate teaching	23		32		36		55		69	
Research	40		33		31		18		12	
Service	16		16		17		16		17	
TABLE 39. In general, how satisfied are you with the system for determining salary increases in your department? (Faculty only) (from question F1)										
Very satisfied	22		14		12		13		14	
Somewhat satisfied	52		48		51		50		48	
Somewhat dissatisfied	20		23		23		27		23	
Very dissatisfied	6		15		14		10		15	
TABLE 40. In general, how satisfied are you with the system for determining promotion and tenure in your department? (Faculty only) (from question F11)										
Very satisfied	38		28		22		24		25	
Somewhat satisfied	45		48		42		49		49	
Somewhat dissatisfied	14		18		26		17		16	
Very dissatisfied	3		6		10		10		10	

SECTION C. SURVEY QUESTIONNAIRES

JOINT POLICY BOARD FOR MATHEMATICS
AMERICAN MATHEMATICAL SOCIETY • MATHEMATICAL ASSOCIATION OF AMERICA
SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS

JPBM COMMITTEE ON PROFESSIONAL RECOGNITION AND REWARDS • 1527 EIGHTEENTH ST NW, WASHINGTON, DC 20036 • 202/588-1100 • FAX 202/588-1853

Dear Colleague:

There have been a number of important issues raised recently in the mathematics community, such as the relationship between research and education, and questions about applied vs. core mathematics. Resolution of these issues cannot be made without a recognition and rewards system that is consistent with both the mission of the institutions of higher education and with the diverse responsibilities of college and university faculty.

The Joint Policy Board for Mathematics has set up a committee, funded by the National Science Foundation and the Exxon Education Foundation, to study the recognition and rewards system in the mathematical sciences. A major part of that study is to find out how the rewards system works now—and how it might be improved.

You are one of a small number of people we are asking to give their opinion on these matters. You were chosen in a random sample of members of the academic mathematical community from all types of institutions across the U.S. Your responses are completely confidential. The identification number will not be used to personally link you to your answers. In order that the results will truly represent people in the profession, it is important that each questionnaire be completed and returned.

This is a very timely and important task, which could have a large impact on the profession. The Rewards Committee will report the findings of this survey, along with its conclusions and recommendations, to the mathematical community in a written report, which will be widely disseminated. Survey respondents will receive a copy of the final report.

We very much appreciate your taking the time to fill out the enclosed questionnaire and return it to us in the enclosed prepaid return envelope as soon as possible.

If you have any questions, please write or call the project director, Dr. William W. Adams, Department of Mathematics, University of Maryland, College Park, MD 20742 (tel: 301-405-5056, electronic mail: wwa@math.umd.edu).

Thank you for your assistance.

Sincerely,

Lynn A. Steen
Chair, JPBM Committee on
Professional Recognition and Rewards

Deborah Tepper Haimo
President, Mathematical Association of America

Michael Artin
President, American Mathematical Society

Robert E. O'Malley, Jr.
President, Society for Industrial and Applied Mathematics

SURVEY OF PROFESSIONAL RECOGNITION AND REWARDS IN THE MATHEMATICAL SCIENCES

conducted by the Joint Policy Board for Mathematics Committee on Professional Recognition and Rewards

FACULTY QUESTIONNAIRE

Your answers to this survey are strictly confidential and solely for the use of the JPBM Committee on Professional Recognition and Rewards. The identification number is to allow followup mailings and to identify the type of institution by survey group, and will not be used for any other purposes. The survey results will be reported only in aggregate form. Please return ***as soon as possible*** *to:* ***Rewards Survey, c/o AMS, 1527 18th St NW, Washington, DC 20036-1358;*** *keep a copy of your return.*
PLEASE CIRCLE THE NUMBER OF YOUR ANSWER UNLESS OTHERWISE INDICATED.

SALARY INCREASES

These first questions are about the system for determining salary increases in your department.

1. In general, how satisfied are you with the system for determining salary increases in your department?

1 Very satisfied
2 Somewhat satisfied
3 Somewhat dissatisfied
4 Very dissatisfied

2 In years when money is available, are merit salary increases awarded to faculty?

☐ NO ➡ Skip to question 8.
☐ YES ➡ **2a.** In determining merit salary increases, what **approximate** weight is typically given to:

Research _____ % Service _____ %
Teaching _____ % Don't know ☐

3. How important for merit salary increases do you think each of the following activities **actually** is?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

4. In determining merit salary increases, are the following activities valued more or less now than they were five years ago?

	More than 5 years ago	Less than 5 years ago	No change	Not applicable
research	1	2	3	4
teaching	1	2	3	4
service	1	2	3	4

5. For determining merit salary increases, **can** the relative weight given to research, teaching and service be altered for individuals to reflect their changing career interests?

☐ YES

☐ NO

6. In general, do you think merit salary increases in your department reflect differences between excellent and average performance in:

	YES	NO	DON'T KNOW
research	1	2	3
teaching	1	2	3
service	1	2	3

7. Is the **amount** of feedback to you about your merit salary increase evaluations:

1 Very satisfactory
2 Somewhat satisfactory
3 Somewhat unsatisfactory
4 Very unsatisfactory
5 Not applicable

*The next questions are about how you think faculty **SHOULD** be evaluated for salary increases.*

8. Which of the following approaches for salary increases do you prefer?

1 Across-the-board increases for everyone ➡ Skip to question 11.
2 Increases based solely on merit
3 Combination of across-the-board increases and merit

9. How important for merit salary increases do you think each of the following activities **SHOULD** be?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

10. For determining merit salary increases, **should** the relative weight given to research, teaching and service be altered for individuals to reflect their changing career interests?

☐ YES
☐ NO

PROMOTION AND TENURE

These next questions are about the system for determining promotion and tenure in your department.

11. In general, how satisfied are you with the system for determining promotion and tenure in your department?

1 Very satisfied
2 Somewhat satisfied
3 Somewhat dissatisfied
4 Very dissatisfied

12. In determining promotion and tenure, what **approximate** weight is typically given to:

Research _____ % Service _____ %
Teaching _____ % Don't know ☐

13. How important for promotion and tenure do you think each of the following activities **ACTUALLY** is?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

14. How important for promotion and tenure do you think each of the following activities **SHOULD** be?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

15. In determining promotion and tenure, are the following activities valued more or less now than they were five years ago?

	More than 5 years ago	Less than 5 years ago	No change	Not applicable
research	1	2	3	4
teaching	1	2	3	4
service	1	2	3	4

16. At the time of promotion and tenure, how important for evaluating faculty performance are assessments from outside the institution?

1 Very important
2 Somewhat important
3 Not too important
4 Not at all important

RECOGNITION AND EVALUATION

17. How much of an incentive for good teaching is each of the following for you?

	Major incentive	Moderate incentive	Minor incentive	No incentive	Not applicable
help students learn	1	2	3	4	5
desire to improve the curriculum	1	2	3	4	5
personal satisfaction	1	2	3	4	5
student recognition	1	2	3	4	5
peer recognition	1	2	3	4	5
institutional expectations	1	2	3	4	5
promotion and tenure	1	2	3	4	5
salary increases	1	2	3	4	5
other institutional rewards (such as sabbatical, equipment, travel support)	1	2	3	4	5

18. How important is each of the following in the rewards system in your department?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
lower division teaching (fresh/soph)	1	2	3	4	5
upper division teaching (junior/senior)	1	2	3	4	5
graduate teaching	1	2	3	4	5

19. Is teaching evaluated in your department?

☐ YES
☐ NO ➡ Skip to question 21.

20. How important is each of the following in evaluating teaching in your department?

	Very important	Somewhat important	Not too important	Not at all important
evaluations by students	1	2	3	4
observation of teaching by peers	1	2	3	4
informal evaluation by peers	1	2	3	4
evaluation by past students or alumni	1	2	3	4
self-evaluation	1	2	3	4
achievement of former students	1	2	3	4
review of classroom materials	1	2	3	4
grading practices	1	2	3	4
efforts to work with students outside of class	1	2	3	4

21. Are you currently doing research?

☐ YES

☐ NO ➡ Skip to question 23.

22. How much of an incentive to do research is each of the following for you?

	Major incentive	Moderate incentive	Minor incentive	No incentive	Not applicable
reduced teaching loads	1	2	3	4	5
making contributions to the field	1	2	3	4	5
personal satisfaction	1	2	3	4	5
peer recognition	1	2	3	4	5
institutional expectations	1	2	3	4	5
summer support	1	2	3	4	5
promotion and tenure	1	2	3	4	5
salary increases	1	2	3	4	5
other institutional rewards (such as sabbatical, equipment, travel support)	1	2	3	4	5

23. Is research by individuals in your department evaluated?

☐ YES

☐ NO ➡ Skip to question 26

24. How important is each of the following in evaluating research in your department?

	Very important	Somewhat important	Not too important	Not at all important
non-refereed publications	1	2	3	4
refereed publications	1	2	3	4
citations	1	2	3	4
grants, contracts or other monetary awards	1	2	3	4
conference presentations or invited talks	1	2	3	4

25. In the evaluation of research, do single-authored papers count more than or the same as co-authored papers?

1 Much more
2 More
3 Same

26. Do you participate in administrative or other service to the department, institution, profession or community?

☐ YES
☐ NO ➡ Skip to question 28

27. How much of an incentive to do service for the department, institution, profession or community is each of the following for you?

	Major incentive	Moderate incentive	Minor incentive	No incentive	Not applicable
personal satisfaction	1	2	3	4	5
peer recognition	1	2	3	4	5
institutional expectations	1	2	3	4	5
summer support	1	2	3	4	5
promotion and tenure	1	2	3	4	5
salary increases	1	2	3	4	5
other institutional rewards (such as sabbatical, equipment, travel support)	1	2	3	4	5

28. Is service by individuals in your department formally evaluated?

☐ YES
☐ NO

29. Considering the mathematics department's contribution to the institution, would you say that institutional support to the department is:

1 very fair
2 somewhat fair
3 somewhat unfair
4 very unfair

30. During a typical academic year, what approximate percentage of your time is spent doing:

_____ % graduate teaching
_____ % undergraduate teaching
_____ % research
_____ % service

31. What approximate distribution of your time do you think would be in the best interests of the institution?

_____ % graduate teaching
_____ % undergraduate teaching
_____ % research
_____ % service

BACKGROUND INFORMATION

32. What is your **HIGHEST** degree and in what year did you receive it?

Bachelor's 19____
Master's 19____
Doctorate 19____

33. Are you:

1 male
2 female

34. Are you currently:

1 tenured
2 untenured, but eligible for tenure
3 not eligible for tenure

35. Including this year, how many years (both full-time and part-time) have you been in your current department?

_____ years

36. Are you currently:

1 full-time
2 part-time

37. On average, how many hours do you spend in the classroom each week? _____ hours

38. What is your academic rank?

1 Professor
2 Assistant professor
3 Associate professor
4 Other (PLEASE SPECIFY) _____

SURVEY OF PROFESSIONAL RECOGNITION AND REWARDS IN THE MATHEMATICAL SCIENCES

conducted by the Joint Policy Board for Mathematics Committee on Professional Recognition and Rewards

DEPARTMENT CHAIRS QUESTIONNAIRE

Your answers to this survey are strictly confidential and solely for the use of the JPBM Committee on Professional Recognition and Rewards. The identification number is to allow followup mailings and to identify the type of institution by survey group, and will not be used for any other purposes. The survey results will be reported only in aggregate form. Please return as soon as possible to: Rewards Survey, c/o AMS, 1527 18th St NW, Washington, DC 20036-1358; keep a copy of your return.

PLEASE CIRCLE THE NUMBER OF YOUR ANSWER UNLESS OTHERWISE INDICATED.

SALARY INCREASES

These first questions are about the system for determining salary increases in your department.

1a. In years when money is available, on average, what fraction of the total salary increase money is awarded on the basis of merit?

_____ % If NONE, skip to question 7.

1b. In determining merit salary increases, what **approximate** weight is typically given to:

Research _____ % Service _____ %

Teaching _____ % Don't know ☐

2. How important for merit salary increases do you think each of the following activities **ACTUALLY** is?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

3. In determining merit salary increases, are the following activities valued more or less now than they were five years ago?

	More than 5 years ago	Less than 5 years ago	No change	Not applicable
research	1	2	3	4
teaching	1	2	3	4
service	1	2	3	4

4. For determining merit salary increases, **can** the relative weight given to research, teaching and service be altered for individuals to reflect their changing career interests?

☐ YES

☐ NO

5. In general, do you think merit salary increases in your department reflect differences between excellent and average performance in:

	YES	NO	DON'T KNOW
research	1	2	3
teaching	1	2	3
service	1	2	3

6. Is the **amount** of feedback to department faculty about their merit salary increase evaluations:

1 Very satisfactory
2 Somewhat satisfactory
3 Somewhat unsatisfactory
4 Very unsatisfactory
5 Not applicable

*The next questions are about how you think faculty **SHOULD** be evaluated for salary increases.*

7. Which of the following approaches for salary increases do you prefer?

1 Across-the-board increases for everyone ➡ Skip to question 10.
2 Increases based solely on merit
3 Combination of across-the-board increases and merit

8. How important for merit salary increases do you think each of the following activities **SHOULD** be?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

9. For determining merit salary increases, **should** the relative weight given to research, teaching and service be altered for individuals to reflect their changing career interests ?

☐ YES

☐ NO

PROMOTION AND TENURE

These next questions are about the system for determining promotion and tenure in your department.

10. In determining promotion and tenure, what **approximate** weight is typically given to:

Research _____% Service _____%

Teaching _____% Don't know ☐

12. How important for promotion and tenure do you think each of the following activities **ACTUALLY** is?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

13. How important for promotion and tenure do you think each of the following activities **SHOULD** be?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
classroom teaching	1	2	3	4	5
student advising	1	2	3	4	5
doctoral thesis supervision	1	2	3	4	5
master's and bachelor's thesis supervision	1	2	3	4	5
curriculum development	1	2	3	4	5
research in the discipline	1	2	3	4	5
interdisciplinary research involving new mathematics	1	2	3	4	5
research on educational issues	1	2	3	4	5
applications of existing mathematics to other fields	1	2	3	4	5
presenting papers at conferences	1	2	3	4	5
presenting colloquiums and seminars	1	2	3	4	5
service to your institution	1	2	3	4	5
service to the profession (e.g., public agencies)	1	2	3	4	5
service as a mathematician to the community (e.g., working with public schools K–12)	1	2	3	4	5
expository writing	1	2	3	4	5
competing offers from other institutions	1	2	3	4	5
receipt of extramural grants and contracts	1	2	3	4	5

14. In determining promotion and tenure, are the following activities valued more or less now than they were five years ago?

	More than 5 years ago	Less than 5 years ago	No change	Not applicable
research	1	2	3	4
teaching	1	2	3	4
service	1	2	3	4

15. At the time of promotion and tenure, how important for evaluating faculty performance are assessments from outside the institution?

1 Very important
2 Somewhat important
3 Not too important
4 Not at all important

ADMINISTRATION OF THE REWARD SYSTEM

16. Rank order each of the bodies on the right in terms of their influence on the following:

(Rank each: 1 = most influence, 4 = least influence)

	Dept. committee	Dept. chair	Faculty committee outside the dept.	Administrators outside the dept.
hiring	____	____	____	____
tenure and promotions	____	____	____	____
salaries	____	____	____	____

17. In years when money is available for merit salary increases, what percentage of the department's recommendations for these merit salary increases has usually been approved without substantial changes?

_____ %

☐ Not applicable, no merit increase

18. In the last five years, what percentage of the department's recommendations for promotion and tenure has usually been approved?

_____ %

RECOGNITION AND EVALUATION

19. For faculty in your department, how much of an incentive for good teaching is each of the following?

	Major incentive	Moderate incentive	Minor incentive	No incentive	Not applicable
help students learn	1	2	3	4	5
desire to improve the curriculum	1	2	3	4	5
personal satisfaction	1	2	3	4	5
student recognition	1	2	3	4	5
peer recognition	1	2	3	4	5
institutional expectations	1	2	3	4	5
promotion and tenure	1	2	3	4	5
salary increases	1	2	3	4	5
other institutional rewards (such as sabbatical, equipment, travel support)	1	2	3	4	5

20. How important is each of the following in the rewards system in your department?

	Very important	Somewhat important	Not too important	Not at all important	Not applicable
lower division teaching (fresh/soph)	1	2	3	4	5
upper division teaching (junior/senior)	1	2	3	4	5
graduate teaching	1	2	3	4	5

21. Is teaching evaluated in your department?

☐ YES

☐ NO ➨ Skip to question 23

22. How important is each of the following in evaluating teaching in your department?

	Very important	Somewhat important	Not too important	Not at all important
evaluations by students	1	2	3	4
observation of teaching by peers	1	2	3	4
informal evaluation by peers	1	2	3	4
evaluation by past students or alumni	1	2	3	4
self-evaluation	1	2	3	4
achievement of former students	1	2	3	4
review of classroom materials	1	2	3	4
grading practices	1	2	3	4
efforts to work with students outside of class	1	2	3	4

23. For faculty in your department, how much of an incentive to do research is each of the following?

	Major incentive	Moderate incentive	Minor incentive	No incentive	Not applicable
reduced teaching loads	1	2	3	4	5
making contributions to the field	1	2	3	4	5
personal satisfaction	1	2	3	4	5
peer recognition	1	2	3	4	5
institutional expectations	1	2	3	4	5
summer support	1	2	3	4	5
promotion and tenure	1	2	3	4	5
salary increases	1	2	3	4	5
other institutional rewards (such as sabbatical, equipment, travel support)	1	2	3	4	5

24. Is research by individuals in your department evaluated ?

☐ YES

☐ NO ➡ Skip to question 27

25. How important is each of the following in evaluating research in your department?

	Very important	Somewhat important	Not too important	Not at all important
non-refereed publications	1	2	3	4
refereed publications	1	2	3	4
citations	1	2	3	4
grants, contracts or other monetary awards	1	2	3	4
conference presentations or invited talks	1	2	3	4

26. In the evaluation of research, do single-authored papers count more than or the same as co-authored papers?

1 Much more
2 More
3 Same

27. For faculty in your department, how much of an incentive to do service for the department, institution, profession or community is each of the following?

	Major incentive	Moderate incentive	Minor incentive	No incentive	Not applicable
personal satisfaction	1	2	3	4	5
peer recognition	1	2	3	4	5
institutional expectations	1	2	3	4	5
summer support	1	2	3	4	5
promotion and tenure	1	2	3	4	5
salary increases	1	2	3	4	5
other institutional rewards (such as sabbatical, equipment, travel support)	1	2	3	4	5

28. Is service by individuals in your department formally evaluated?
- ☐ YES
- ☐ NO ➡ Skip to question 30

29. Do you evaluate the quality of service, e.g., by soliciting evaluations from the chairs of committees served on, or from recipients of the service performed?
- ☐ YES
- ☐ NO

30. Considering the mathematics department's contribution to the institution, would you say that institutional support to the department is:

1 very fair
2 somewhat fair
3 somewhat unfair
4 very unfair

BACKGROUND INFORMATION

31. Including this year, how many years (both full-time and part-time) have you been in your current department?

_____ years

32. Including this year, how many years have you been chair of this department? _____ years

33. How many full-time faculty are in the department? _____ full-time

34. How many part-time faculty are in the department? _____ part-time

35. On average, how many hours are spent in the classroom each week by:

	Number of hours
full professors	_____
associate professors	_____
assistant professors	_____